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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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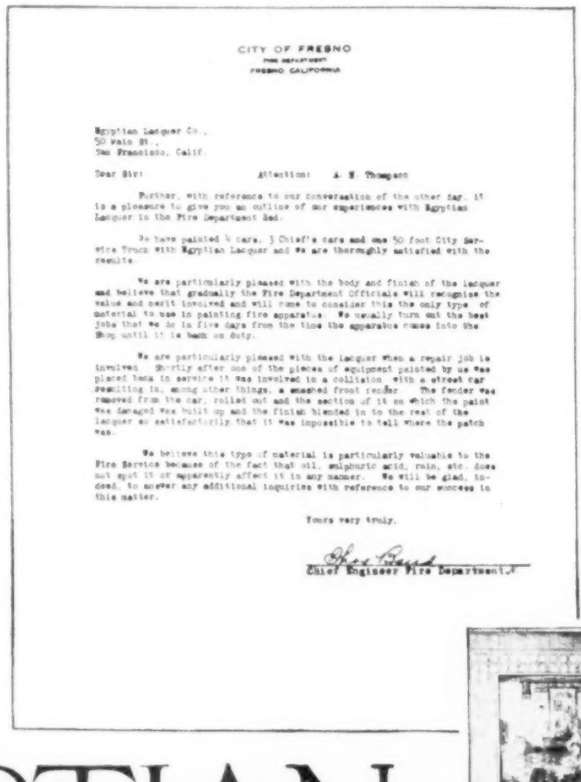

CITY OF FRESNO
FIRE DEPARTMENT
FRESNO, CALIFORNIA

Egyptian Lacquer Co.,
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San Francisco, Calif.

Dear Sir: Attention: A. H. Thompson

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Chief Engineer Fire Department.

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Vol. 25 NEW YORK, SEPTEMBER, 1927 No. 9

Smelting Secondary Tin

The Metallurgical Treatment of Tin Residues—Part I.

Written for the Metal Industry by E. R. THEWS, Metallurgist

A discussion of the metallurgical treatment of tin residues, ashes, slags, dross, etc., cannot be limited to pure tin materials alone, of course, since residues of this class are not available in sufficiently large quantities to permit of the uninterrupted and efficient production of pure tin. For this reason, tin ashes are usually treated together with solder ashes and other lead residues and slags containing considerable amounts of tin, so that in the large majority of smelters the final products obtained are tin-lead alloys of all possible compositions almost exclusively.

BLAST FURNACE SMELTING

The treatment of these residues may be carried out in reverberatory as well as blast furnaces, both of which possess certain specific advantages depending upon the composition and metallurgical properties of the materials treated. There can be no doubt, however, that of the two types of furnaces, the reverberatory furnace has generally proved to be the most advantageous for smelting all kinds of true tin ashes and slags, particularly for those rich in tin.

As a result, tin blast furnaces have been and are still being replaced by reverberatory furnaces in many parts of the world. Particularly on the Continent, in Bohemia, Saxony, etc., they will soon have disappeared. It would be absolutely wrong, however, to adopt the same attitude in smelting tin-lead residues, since wherever large quantities of these materials have to be worked into lead-tin alloys containing 40 to 50 percent of tin, the blast furnace has doubtlessly proved to be the most efficient type of furnace technically and economically. Besides permitting of a more effective removal of the impurities and of a cleaner separation of metal and slags (matte, speiss), blast furnaces give larger yields and require less fuel and labor than reverberatory furnaces.

These advantages of the blast furnace are opposed by the following more or less serious disadvantages:

1) Small grained, powdered materials, such as a large part of the tin ashes obtained, cannot be charged into the blast furnace without previous briquetting or slagging. In practical smelting work this disadvantage is taken care of by giving the residues in question a preliminary treatment in the reverberatory furnace, transferring the slagged material to the blast furnace for final extraction.

2) Blast furnace smelting of tin residues occasions a comparatively high loss of tin by volatilization, the tin volatilized in treating residues very rich in tin reaching as high as 10 percent of the total amount of tin contained. Of course, a large part of this metal is regained by collecting the condensed vapors in the flue channels or in dust-catching devices, but the absolute loss of tin still remains relatively high unless very expensive dust catching devices, such as the Cottrell system, are installed. The loss of tin by volatilization may be lessened somewhat by increasing the height of the furnace, but this measure tends correspondingly to diminish its melting efficiency.

3) The metal or alloys produced in blast furnaces contains appreciably more iron than the respective products obtained in reverberatory furnaces. However, this disadvantage may easily be countered by corresponding changes in the organization of the smelting operations in general as expressed by the flow sheet of the smelter.

Thus it is seen that the several disadvantages, large as they may appear at the first glance, may be reduced to a minimum by carrying out the construction of plant and conducting the smelting operations accordingly. In any case, wherever the blast furnace is not, for some reason, used as equivalent melting device side by side with the reverberatory furnace, it cannot be excelled in finish-treating the reverberatory residues comparatively rich in tin and tin alloys in order to extract this metal almost completely by alloying with iron or lead.

MODERN BLAST FURNACES

Contrasting considerably with the heavy, old fashioned types of tin blast furnaces, modern constructions—as purchased from the furnace builders—consist principally of light and easily transported steel mantels supplied with a comparatively thin lining of high class fire clay bricks and fitted with 2 to 6 tuyeres. Water jackets are not always used with tin blast furnaces.

These furnaces are hardly ever used for smelting tin ores, but give comparatively good results with high grade tin ashes, rich in iron and copper, as well as with tin slags of all types, although in this case also the comparatively large loss of tin by volatization remains the chief disadvantage of this type of furnace.

Fig. 1 shows a tin blast furnace built by the author. The furnace is supplied with water jackets on two sides and with 4 tuyeres. The distance between the tuyeres is 35 inches. Slag and metal leave the furnace together as

soon as formed, flowing into the forehearth shown. Before commencing operation the bottom of the forehearth must be covered with fused metal in order to prevent the slag from penetrating into and closing up the connecting channel. The forehearth serves as a settling device, the slag being drawn off over a spout located at the most distant part of the settling chamber, while the metal collects on the hearth until it has risen far enough to be ladled out, the connecting channel being left covered with metal at all times, of course.

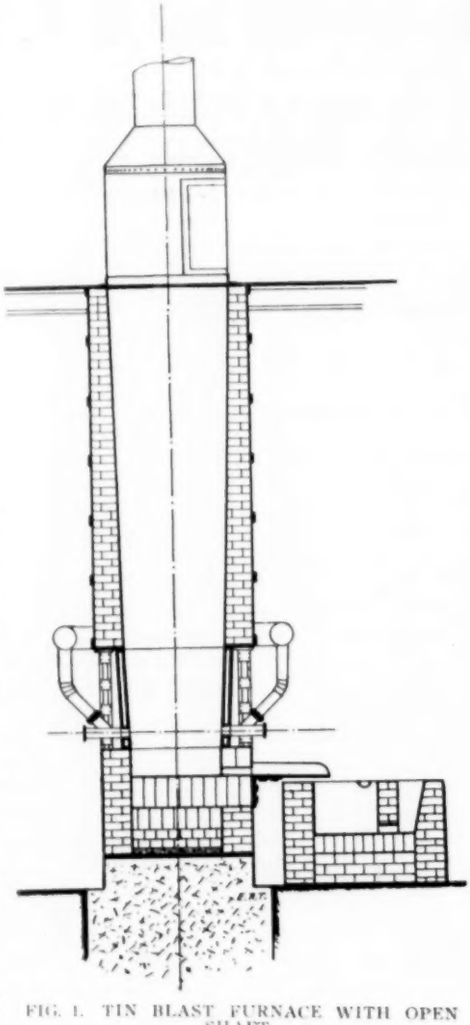


FIG. 1. TIN BLAST FURNACE WITH OPEN SHAFT

The little attention generally paid to the special requirements of tin blast furnaces — which is often responsible for the bad performance of the blast furnaces as compared to reverberatory furnaces — is well demonstrated by the fact that, apart from the general features of the furnace, the devices for charging and for drawing of the gases are usually copied from lead blast furnace constructions.

There is but one construction suited to the special requirements of the tin blast furnace, an absolutely open shaft for charging and for drawing off the furnace gases through a hood located on top of the shaft (Fig. 1). The other construction shown in Fig. 2, which is frequently found in Continental smelters, is faulty for two reasons:

1) Since the gases are drawn off at the side of the furnace, they will not be forced to pass up the center of the column, where they are required in order to effect the chemical reactions necessary, but will be drawn up along the walls of the furnace. This may be counteracted to some degree by charging the materials so as to deposit the fines around the sides of the column, leaving the coarse particles in the centre, thus forming the path of least resistance. This method of charging is very tedious, however, and cannot, in view of the construction of the charging funnel, be controlled farther down the shaft.

2) A large amount of the metallic vapors carried up by the gases is always regained within the furnace, or in the first part of the flues, if the gases are cooled by the air above the charge column. This is not possible in this case, however, since the gases are drawn off comparatively far below the top of the charge column.

These disadvantages are avoided by constructing the upper part of the blast furnace as shown in Fig. 1 where, with correct charging methods, the gases are drawn up uniformly throughout the entire cross-section of the charge column, while the metallic vapors, particularly the tin and lead, are largely condensed by cooling and diluting the gases with atmospheric air with which they are mixed while passing through the hood. By interposing a few large dust chambers in the flue channel directly behind the furnace, a large part of the tin evaporated may thus be regained.

SMELTING PRACTICE

In smelting residues rich in tin in blast furnaces, no attempt should be made to obtain slags poor in tin at one smelting. The slags produced must be subjected to a second or, even, third smelting treatment, while in smelting the residues main attention should be paid to the production of as large quantities of metal as possible, irrespective of the percentages of tin remaining in the slag.

It is also advisable not to adjust the smelting process to the treatment of certain well defined raw materials, but to the production of certain alloys to be used as base alloys in the manufacture of technical alloys, such as tin solders, low grade bearing metals, or tin alloy.

The raw materials suitable for blast furnace smelting, such as slags, dross, scums, segregation and liquation residues, etc., are mixed with the requisite amounts of coke, lime, and other slag forming materials—iron oxide, fluorspar, etc.—and with sufficient quantities of thin iron scrap to combine with the very harmful contents of arsenic and sulphur present. Metallic iron is also required to assist in the reduction of metallic oxides. As a rule, a small amount of a mixture of equal parts of soda ash and solder ash is also added.

The addition of comparatively large amounts of powdered or small grained materials must be avoided under all circumstances, since relatively small percentages of this material will appreciably lower the melting efficiency and cause a corresponding increase of loss of tin by volatilization.

In order to reduce this loss to a minimum, it is absolutely necessary to pay attention to the exact proportion of coke added to the charge. As a rule, 8 to 8½ percent of coke will be quite sufficient. If the quantities

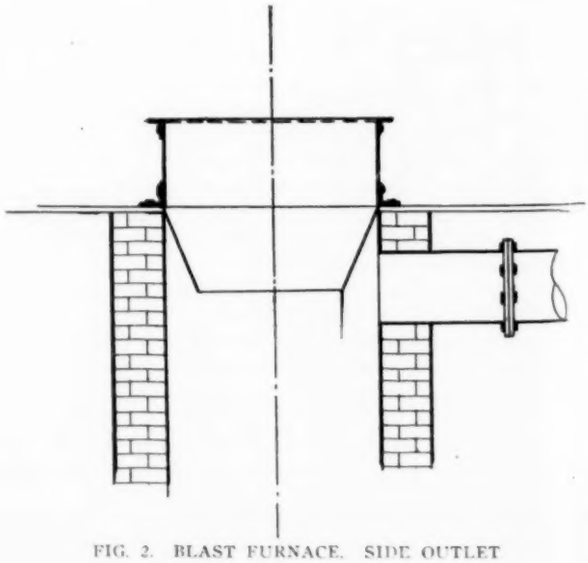


FIG. 2. BLAST FURNACE. SIDE OUTLET

of coke required are exceeded, large amounts of hot carbon monoxide gases are forced up through the charge, bursting out in flames at the level of the charging floor, and the heavy white fumes evolved are sufficiently clear evidence of the quantities of tin and other metals burned.

Similar, if not worse, difficulties are caused by the addition of insufficient percentages of coke to the charge. Since the amounts of coke passing down to the tuyere region do not suffice to satisfy the normal reduction processes necessary, the zone of reduction is carried higher and higher up the shaft of the furnace, the hottest section of the furnace being transferred from the tuyere section, where it is needed, to some part of the shaft, preventing the reduction of a large part of the tin contents of the charge which are vaporized instead. A natural consequence of the dislocation of the zone of reduction is the chilling of the tuyere section by the cold blast which cools off the slag, the entire operation of the blast furnace being retarded more and more, so that if the amount of coke added is not quickly suited to the requirements, the furnace will be frozen within a few hours.

Similar difficulties may be occasioned by working with too small charges where the layers of coke interposed between the layers of metallic material and fluxes follow sufficiently close upon each other to enable the fire gradually to rise up to the top, vaporizing large quantities of metal and leaving the tuyere section cold and unresponsive to normal treatment.

In all these instances, the causes of trouble and the difficulties created cannot be eliminated by merely removing the causes, that is to say, by increasing or decreasing the percentages of coke added, by increasing the weights of the individual charges, etc. The reduction of the blast pressure often suggested will also tend frequently to increase the disorder by reducing the temperature of the tuyere section still further.

Pouring or sprinkling water over the surface of the charge, another common "patent remedy," will never be able to reach the root of the evil, since after the rapid evaporation of the water added, the top fire will reappear almost immediately.

Best results are attained if the charge column is allowed to sink down a little and adding 2 or 3 straight slag charges (containing only 6 to 7 percent coke), eliminating at the same time, but as gradually as possible, the cause of the trouble.

SLAGS AND FLUXES

Since in most acid tin slags the tin is present as stannous oxide-silica compound, the slags produced in blast furnace smelting should be made as basic as possible. The more acid these slags, the more difficult the reduction of the oxide to tin by the action of carbon or iron. It should be noted that carbon is able to reduce the oxides of tin, not the silicates. As a rule, the tin slags should contain about 10 to 15 percent CaO, 40 to 45 percent FeO, and 30 to 35 percent SiO_2.

In this connection, attention should be called to the fact that in contrast to the usual stage of oxidation of the tin oxide compounds present in tin slags, certain slags very rich in tin, which have been produced under the influence of strongly oxidizing atmospheres in reverberatory furnaces, may also contain stannic oxide, SnO_2. It appears impossible, however, to produce such a slag in blast furnace smelting.

The slags produced in residue smelting are always foul, averaging 5 to 10 percent or even 15 percent of tin, and must be re-treated once or twice in order to remove this valuable content. The slags are mixed with the requisite amounts of coke, limestone, and iron scrap, such as de-tinned tinplate scrap, thin walled iron scrap, etc., and passed through the blast furnace. It is impossible to clean the slag in an economically and technically efficient way in the reverberatory furnace.

The same applies to the removal of the metallic tin beads contained in the slags by mechanical means, that is to say, by breaking and grinding the slag and sieving or picking out the beads. Since even after such a mechanical treatment, the slags are still too rich not to be run through the blast furnace, it is not rational to include this expensive and entirely unnecessary intermediate treatment in the refining process of tin slags.

Since most of the foul tin slags and reverberatory slags produced are more or less acid in nature, the charge must be made up so as to obtain a somewhat basic reaction. The slag composition to be aimed at should be as follows:

45—50% FeO; 10—18% CaO; 30—35% SiO_2

Fluorspar, which in blast furnace smelting of tin ashes may often be added to advantage, is practically useless in slag smelting, since, as will be brought out later on, the object is not to produce as much metal as possible but to clean the slags as thoroughly as is compatible with the economy of the process, so that the operation of the furnace must of necessity be slower than in smelting residues. Thus, it is unnecessary, if not unwise, to speed up the process by adding fluxing agents, such as fluorspar.

In slag cleaning smelting, the oxides of tin are reduced to metal, and tin silicates present are decomposed by replacing the stannous oxide contained in the compounds with lime and iron oxide.

The iron scrap added to the charge does not serve for the reduction and precipitation of tin compounds by direct substitution, as is frequently claimed, but for the reduction of the oxides of lead contained in the charges, and, if arsenic and sulfur is present, for the separation of these harmful elements and their concentration in the matte and speiss. Apart from the other constituents, the speiss will always take up part of the antimony present, while a certain, relatively large, amount of copper is dissolved by the matte. By correctly proportioning the amounts of sulfide material added to the charge, practically all of the copper contained in the residues may in this way be removed from the tin or tin alloys produced. Instead of iron, iron oxide in form of iron slags, iron scale, iron ores, etc., may be added.

IRON TIN ALLOY

Since in slag cleaning smelting, only part of the reduced tin would actually be obtained in the pure condition, this must be bound to another metal, that is to say in this case, lead or iron, and obtained as lead-tin or iron-tin alloy. If at the end of the process the tin is to be obtained in as concentrated a condition as possible, a tin-iron alloy should be produced which contains about 30 to 40 percent tin and 55 to 65 percent iron.

Another disadvantage of the tin-iron alloys produced is their corrosive action on the refractory furnace lining, even the most alkaline and resistant fireclay bricks being attacked in a very short time.

The process must be conducted as reducing as possible, of course, in order to reduce the necessary amounts of metallic iron from their oxides. If this degree of reduction has been attained, the de-tinning of the slags must of necessity be perfect, since tin oxides are much more easily reduced than the oxides of iron. If the process has been conducted efficiently, the final slags should not contain more than about 1 percent of tin.

The iron-tin alloy produced is granulated by passing into cold water, and the tin extracted by smelting with lead-tin alloys.

This article will be concluded in an early issue.—Ed.

Aluminum Alloys and Their Castings

An Article Describing Current British Practice in Aluminum—Part I.

Written for The Metal Industry by WALTER BANNARD, Metallurgist

As is quite well known, castings in aluminium alloys are made by three essentially different processes, namely, sand casting, gravity die casting, and pressure die casting, the latter two processes being known in the States as permanent mould and die casting respectively.

The properties of the castings produced by these three processes are markedly different from one another, and the engineer should know the field of application, properties and limitations of each class before drawing up specifications for aluminium alloy parts. In the same way he should know which alloy to specify as being the most suitable for the work in hand.

The greatest tonnage of aluminium alloy castings is, of course, produced in sand and this method is indicated where the parts are large, require complicated coring, or where a limited number of pieces is needed, whereas both die and permanent mold work are more or less confined to relatively small castings; the former when very large quantities are required and the latter when only moderate numbers will be ordered, but there are other factors which will govern the choice of method, e. g., the mechanical properties of the castings produced.

PART I. ALUMINIUM ALLOYS

Although in common parlance "Aluminium" castings are frequently referred to, it is probably superfluous to remark that aluminium in its pure state is hardly ever used in the form of castings. It is only thus employed in some few isolated instances such as electrical switch parts or cable connectors where the relatively high conductivity of the metal is taken advantage of or in the manufacture of cooking or other utensils which are employed in the preparation of foodstuffs and where freedom from any toxic properties is an important factor.

The "Aluminium" of which the innumerable castings of commerce are composed is almost invariably an alloy with some other element or other elements, most generally either copper, zinc, silicon, magnesium, or nickel and sometimes several together in combination.

The alloys generally employed are not random mixtures, but are combinations with aluminium which as the result of many years' practical and theoretical study have been found to be the most satisfactory for the purposes to which they are applied.

Until as late as the early years of the War there were indeed many rather uncertain aluminium alloys employed in commerce, which were largely the proprietary mixtures of individual founders, and firms of metal merchants whose object was often more to obtain an alloy of different name and composition from that of their competitors than to provide anything having the best possible properties from the point of view of application of the material.

Such proprietary alloys were often very complex. With the War and the enormous demands upon the Aluminium founder for aero and automobile castings came the necessity for definite standards of composition so that the purchaser could know what alloy he had and what properties he had to expect from it.

As a result, several casting alloys which really originated in the laboratories and were fairly well scientifically understood, became standardized by the British Engineering Standards Association and are now known as B.E.S.A. specifications.

"3L11"—"2L8"—"2L5"—"L24"

At this stage many of the Proprietary mixtures fell out of favor since in most cases there was nothing to recommend them except the claims of their manufacturer, and the B.E.S.A. alloys gained general employment.

BRITISH ENGINEERING STANDARDS ASSOCIATION
SPECIFICATIONS FOR ALUMINIUM CASTING ALLOYS

Specification No.	Chemical Composition Per Cent.	Impurities not to be Exceeded Iron %	Silicon %	Lead %	Zinc %	Tin %	Minimum Tensile Properties called for: Tensile strength Tons per sq. in.	Elongation per cent on 2 in.
3L11	**Copper** not less than 6 or more than 8. **Tin** may be present up to 1. **Aluminium** remainder.	0.80	0.70	0.10	0.10	....	Not less than 9	Not less than 3.
2L8	**Copper** not less than 11 nor more than 13 **Aluminium** remainder.	0.80	0.70	0.10	....	....	Not less than 9	Nil
2L5	**Zinc** not less than 12.5 nor more than 14.5.	0.80	0.70	0.10	....	....	11	3
L24	**Copper** not less than 4.5 **Nickel** not more than 4.5 **Magnesium** not less than 1.2 nor more than 1.7 **Aluminum** remainder.	0.80	0.70	0.10	0.10	0.10	As cast. Not less than 11.	....

(a) The **Aluminium** used for the above alloys shall be virgin metal. The **Copper** shall assay not less than 99.3 per cent. The **Nickel** shall assay not less than 99 per cent. The **Zinc** shall assay not less than 99.5 per cent.

(b) Test-bars 1″ in diameter and 7″ to 9″ long, cast in iron chills which have been heated before they are filled. The bottom of the chills closed with a sand or clay plug.

These alloys do not necessarily represent the best that science can obtain with regard to aluminium alloys, but so far as casting alloys are concerned no other combinations giving markedly superior figures have yet been discovered—and the ground has now certainly been ploughed over pretty thoroughly both by the scientists and the practical men in the industry. Nevertheless it is still quite possible that some new combination giving much superior properties may be discovered.

The above figures are of course on the low side and the actual figures obtained range about four tons per square inch higher, in the case of chill cast bars. In the case of "L24," known as "Y" alloy and practically dis-

covered at the National Physical Laboratory, Teddington, England, heat treated cast bars give about 20 to 21 tons per square inch.

Sand cast bars, of course, always give lower figures as do bars cut from sand castings. Especially does this apply to elongation which rarely rises above 1 or 2 per cent in the case of sand castings of any of the alloys referred to.

The alloys with from 10 to 13 per cent of silicon are a new and useful addition to the list and are gaining increasing favor and employment in those foundries where their behavior and the necessary modification process either with metallic alkali metal or alkaline fluoride is understood and permissible.*

The modified silicon alloys are known under various names including Silumin, Alpax, etc., and have properties which from many aspects are far in advance of the older known alloys. The tensile strength of chill cast bars is about 13 to 15 tons per square inch with 14 per cent elongation while the slightly lower figures of 10 tons and 9 per cent elongation would be obtainable from sand cast bars or bars cut from actual castings.

There is as yet no B.E.S.A. specification for this alloy but one is under consideration at the present time.

These five alloys then represent practically all that are employed by the best English founders and provide a sufficient variety of properties for most purposes.

APPLICATIONS AND FOUNDRY PROPERTIES

For castings which will be used in contact with foodstuffs, for example, cast kettles and saucepans, a sixth alloy finds pretty general favor in England, namely 3 per cent. copper, remainder aluminium.

This alloy gives castings reasonably free from foundry troubles when cast in the thin sections which are generally required for this line of work.

The castings are malleable to a high degree, will take a good polish and are free from porosity, all factors which have to be taken into consideration when the castings are to be applied to domestic service.

With regard to the applications of the other alloys mentioned above, the 2L5 specification is generally used for crank case and sump castings for internal combustion engines and for all the usual run of aeronautical and automobile engineering parts such as have nothing more demanded of them than reasonable rigidity and fair tensile strength at normal temperatures.

This alloy, as, however, are all alloys containing zinc in fair amount, is very hot short, readily forming cracks while cooling from the liquid and pasty states in the mould —it has no strength at the solidification temperatures and its tensile strength rapidly falls as the temperature is raised above the normal.

Such an alloy is therefore never employed for pistons, the temperature in which may be safely assumed to rise in some cases as high as 350 deg. C.

The strength of the various alloys mentioned, at this temperature, is as follows:

"2L5" tensile strength tons per sq. in. at 350° C. is 2.1
"3L11" tensile strength tons per sq. in. at 350° C. is 3.0
"2L8" tensile strength tons per sq. in. at 350° C. is 4.7
"L24" tensile strength tons per sq. in. at 350° C. is 5.1
10-13% Silicon tensile strength tons per sq. in. at 350° C. is 4.7

Hence the pistons whether of the usual small size for automobile internal combustion engines or of the larger sizes for Diesel oil engines the alloys L24 or 2L8 are almost invariably employed. The latter has, until lately, been the most generally used, but during the last year or two L24 has come into considerable favor in the highest class foundries where there is sufficient metallurgical skill available to handle the material properly. "L24" or "Y" alloy castings are usually supplied heat treated while "2L8" is left "as cast" and pistons may be fitted direct in the engine after machining. A better plan, however, in the case of 2L8 is to anneal the pistons for say 10 hours at about 400° C., thereafter allowing them to slowly cool out of any draughts. This treatment enables any existing casting stresses to be relieved before machining is undertaken, so that if there has been any tendency to growth or distortion it will be rectified during the final machining operations, whereas if the pistons had not been annealed, growth might take place in the engine with such results as seizure or at any rate bad wear on both piston and cylinder walls.

The treatment to which alloy L24 castings are always subjected before use is heating at 510° C. for 10 to 12 hours followed by quenching in boiling water and maintaining at this temperature of 100° C. for several hours. The first part of the treatment has for object the solution of constituents which at lower temperatures are precipitated if the cooling is slow. By rapid cooling from 510 to 100° C., the soluble constituents are retained in solution being unable in so short a space of time to become precipitated. The effect of boiling the alloy in water is then to accelerate the precipitation of particles of the insoluble constituents in an extremely dispersed state and this causes the hardening which is known to take place under these conditions.

The main difficulty associated with the employment of the alloy (L24) in the foundry is attributable to its content of magnesium (to the extent of 1.5%) which being very readily oxidized tends to form drossy inclusions in the castings. These show up only on machining, and in the walls of pistons are objectionable to the customer.

He thinks that they tend to form planes of weakness in the piston and in addition score the cylinder walls, but in all probability his claims are more imaginary than real.

The inclusions are actually the broken up and dispersed skin of magnesium oxide which forms on the exterior of the molten stream of alloy where it is exposed to the air on entering the mould. The best way to avoid this defect is to stir some ammonium chloride into the melt just before pouring and then skim the pot very thoroughly, afterwards pouring with the mouth of the crucible or ladle as close as possible to the mold and a runner of minimum possible depth.

It is desirable to deliver the metal as smoothly and with as little turbulence as possible, avoiding tortuous paths in the form of gates and runners.

If permanent mold pistons are being poured it is well to have the maintaining—or "ladling out" pots frequently fluxed with ammonium chloride (sal ammoniac) and then very thoroughly skimmed.

To remove all oxide from the molten metal and then re-form as little as possible during pouring are the main desiderata.

Specification "3L11" is a useful alloy and is required by some aeroplane engine makers for such parts as crank cases, induction pipes and small accessory parts. It is not, however, used in England to anything like the extent that "2L5" alloy is employed.

In America "3L11," known as No. 12, is more generally used than any other aluminium alloy.

The modified silicon-aluminium alloys, variously known as Silumin, Alpax, etc., are gaining considerable favor in both England and America largely on account of their excellent foundry properties, less weight, greater resistance to corrosion and malleability. The silicon content is

* The modification process as applied to these alloys is patented by several of the large foundry concerns and so can only be done under license.

made to vary from 9½ to 13% of Silicon, according to the ideas of the makers.

In the molten state they are very fluid and will run thin sections with ease where other alloys could not be used. Sections 3/32 inch thick can be run in sand moulds provided the objects are not too large, and hence the distance to be traveled by the liquid metal not too great.

These alloys are not hot short and so present none of the difficulties of formation of cracks at contiguous thick and thin sections where the relative rate of solidification is different and would give rise to cracks in most other aluminium alloys. By virtue of the silicon content, an element lighter than aluminium itself, the alloys are lighter than aluminium and considerably lighter than copper or copper-zinc alloys. The specific gravity is about 2.65 as against 3.01 for 3L11 alloy.

These alloys are markedly resistant to corrosion as is evidenced by the numerous practical and scientific tests, as also by the large purchasings of the material by shipbuilders for use on board sea-going ships. The corrodibility in sea water is about the same as that of pure aluminium and markedly less than that of any of the other alloys, "L24" coming a good second.

The malleability is a valuable property both in the mold and in the final casting, for in the former case, solidification contraction which sets up stresses in the castings does not result in cracks or any great internal strain since this is relieved in the material while still hot in the mold.

With regard to the malleability of castings in the cold, this is important as permitting of castings which are perhaps slightly distorted or off size to be bent without reheating to the desired shape.

PINHOLES

Although the best obtainable at the present state of the art, the five alloys in general use do not represent the founder's dream of Utopia by a long way, as will be indicated later. They have some objectionable properties from the foundry point of view, but perhaps one of their worst is their tendency—common to all aluminium alloys—to absorb much gas during melting, especially if the temperature rises too high. This gas they liberate on freezing giving rise in thick sections to the well known "pinholes" which show up on machining.

The real cause of pinholing is not actually known as yet, but it is pretty certainly due to at least two factors, firstly, shrinkage which takes place in the metal on passing from the liquid to the solid state, and secondly, to the liberation of gas during this same period. It is most probable that both factors exert an almost equal share in the causation of pinholes.

In thick sand cast section of the alloys "3L11," "2L8," "2L5" and "2L24," the pinholes which show up on machining are uniformly about half a millimeter in diameter, but in the silicon alloys they are quite twice as large and are pretty equally disseminated throughout the whole mass of the casting. The size depends, however, largely on the thickness of the casting. Such pinholes cause many rejections and unfortunately often only when much expensive machining has been put in on the job. Their prevention is not difficult, usually being accomplished by placing an iron, aluminium, or brass chill on the part in question, provided that it is practicable to do so.

Chills are apt to be a source of danger, though they must be quite warm or they will generate steam on pouring and so blow the casting.

USE OF SCRAP

Oxide of aluminium is another source of trouble to the founder, giving rise as it does to planes or points of weakness which during the hot—short stage—to which all of the copper alloys and especially the copper zinc alloys are susceptible, provide nuclei for the commencement of rupture during the simultaneous shrinkage which is occurring. Hence cracks in the final castings.

The employment of remelted scrap in ingot form, such as can be purchased from metal merchants £20 or £30 a ton cheaper than virgin metal, is a very risky proceeding and often involves the founder in more expense than the employment of the virgin metal would have done.

The ingot may, and usually does, look alright, the chemist examines it for a surface sink or coarsely crystalline fracture, the first of which would indicate a high pouring temperature, hence gas absorption, and the second, high iron or manganese content which would decrease the fluidity and markedly increase the liability to cracking.

Finding none of the above defects, he may then proceed to analyze and find that the chemical composition is reasonably good, namely, that there are no appreciable amounts of objectionable elements. On the face of it, then, the scrap is alright—the manufacturing of the first batch of castings may, however, prove the reverse to be the case. Dissolved gas or oxide or both, not analytically detectable, may be present, and give untold trouble such as cracks, draws, sinks, shrinks, pinholes, and porosity.

The best way to try out scrap bought in this way is to ascertain that analysis is satisfactory, that there is no appreciable surface sink, and that the fracture is close and fine grained. Having done this it is best to run a quantity of the alloy—a ton or half a ton—in the foundry, break it down by the necessary additions of zinc and copper to the alloy required. Use none of the ordinary run of foundry scrap with it but try it alone in some difficult castings. If it gives no more than the usual trouble then it is pretty safe to go on to larger quantities.

The judicious use of such scrap is a great advantage to the economical running of a foundry if it is possible to employ it, since there is often a saving of £20 or £30 per ton in this way and the resulting castings are often as good as if only virgin ingot has been used.

This article will be concluded in an early issue.—Ed.

Ingot vs. Scrap Copper

Q.—We wish to get some information regarding ingot copper and copper wire. Is there any difference between products made of ingot copper and made from scrap trolley wire or any good scrap copper wire?

We have been told that used copper wire has lost something by use and that a bronze bearing made of scrap copper wire is not as high grade as if made from virgin copper.

A.—The difference between scrap copper and ingot copper is in the amount of copper oxide they contain. All metals, including copper, are covered with oxide on the outside surface. Ingot copper 25 lbs., say 12 in. x 4 in. x 3 in., will contain approximately 144 sq. in. of surface, and all this surface is covered with oxide. Now take 25 lbs. of scrap copper and see the amount of surface 25 lbs. will contain; approximately ten times more on trolley wire than ingot copper. Therefore, you have a lot more of oxide to contend with than in ingot copper.

There is no question but ingot copper (lake or electro copper) will make better castings than scrap copper handled properly in melting. We do not want to say, however, that good castings can not be made from scrap copper, but better castings can be made from ingot copper of the grades mentioned above; that is stronger and cleaner castings. But for all commercial purposes copper trolley will make satisfactory brass and copper castings when properly handled.—WILLIAM J. REARDON.

The Fundamentals of Brass Foundry Practice

A Description of the Basic Laws Which Control the Melting and Casting of Metals and Their Application to Practical Foundry Operations*—Part 12

Written for The Metal Industry by R. R. CLARKE, Foundry Superintendent

Third. Where the mold includes frail parts (beads of sand, pockets and hillocks of sand, sharp projections of sand etc.) unable to withstand the action of the metal against them. Here we have a wide variety of conditions and similarly a chance to contend against them. First of all careful and judicious gating and pouring of the mold may solve the difficulty. Wherever a mold contains delicate projections of green sand, the gating should be to spare these parts the in-rushing current of metal and to deliver the metal to the mold as placidly as possible. To this end, the gating point, the mold direction of the metal currents and the constructive principles of the gate are the main items. Briefly this gating point should not occur too close the more delicate parts of the mold and the gate should be so constructed as to direct currents of metal out of line with them.

Figures 43 and 44 will illustrate. Fig. 43 is a fairly heavy brass ring made with green sand core. If gated

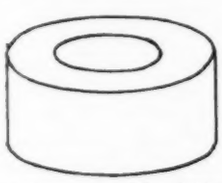


FIG. 43. BRASS RING

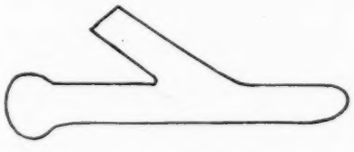


FIG. 43a. GATE FOR FIG. 43

straight in at right angles to the core the impact of current against the core will often dig into the core displacing sand that will go into the casting. The same gate entering at 30° to 45° to the core spares the core this direct smash. To deliver the metal less violently to the mold it is only necessary to change the direction of motion in the gate. Instead of leveling the gate direct from the sprue into the casting resort to Fig. 43a, run the metal to a point beyond the gating point in the casting thence back to this gating point. Fig. 44 represents a brass oil disc. If gated at A, the delicate green groove sand in the centre will frequently work away. Gated at B the likelihood is of course less. Gated at C and in line with the groove is by principle and has been found by practice to be the safest and best method.

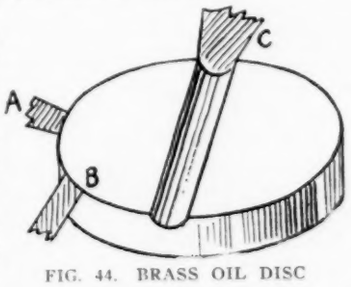


FIG. 44. BRASS OIL DISC

The dry core used either as a ram-up or a print set core to displace different delicate green sand parts of a mold is another possibility of advantage. The dry core can also often be used at points of hard impact of metal as in the green core of Figure 1 where a section of dry core can be set in the green core opposite the point of gate entrance. Under frail types of mold parts fall also different classes of ornamental work such as grille work, lettered tablets, name plates, etc. In this class the limit is not far off to which green sand can be safely carried. Yet in many instances the author by using the compound facing previously mentioned and in dry-green state, has made such castings in an all green mold that could not have otherwise been ventured.

The placid delivery of metal to a mold reverts to the laws of motion and involves chiefly either a choking of the gate channel or a change of direction from the straight line of transit. In the case of choking the gate by narowing its dimensions, this choking or narrowing should occur at a point between the sprue and the casting as in Fig. 45 rather than at the casting as in Fig. 45a. In the former the metal enters

FIG. 45. CORRECT CHOKING GATE

FIG. 45a. INCORRECT CHOKING GATE

the mold in less volume and more placidly. In the latter the entering volume is reduced but the violence from speed of inflow is unchecked. In changing direction, briefly the check on violence varies with the degree of change and with the angle of change as distinguished from the curve of change. Thus in Fig. 46 the force of the metal diminishes with forms 1, 2, 3, 4 and 5, supposing the casting to be on the left.

FIG. 46. RUNNER WITH VARIOUS ANGLED GATE

Probably the most placid entrance of metal to a mold is to deliver at the mold's lowermost point and allow the metal to rise in the mold. This involves the horn gate or its modified form as in Fig. 47. With respect to the horn gate itself it must be noted that this gate involves the nozzle principle and the curve of change and under hard or fast pouring by no means delivers metal gently especially at the beginning of pouring or until after the bottom of the mold is well covered with metal. The upward spouting of metal from a horn gate is violent and in shallow molds will smash against the top or cope sand of the mold and tear it away. The modified form of the horn gate as in Fig. 47 obviates this violence. In practice this form of gate has been found very trustworthy and efficient.

Fourth. Where the mold has a broad, expansive and flat bottom surface over which the metal flows in pouring; or where some form of mold invites great quantities of gate metal flowing over some localized sand or some treacherous form of sand susceptible to cutting scabbing or washing away.

* All rights reserved. This series will be collected and published in book form. Parts 1 to 11, inclusive, were published in our issues of July, August, September, October, November, 1926. January, February, March, April, May and August, 1927.

When liquid metal strikes a green sand surface it immediately dries and glazes that surface to a thin delicate dry crust. Underneath this crust a line of

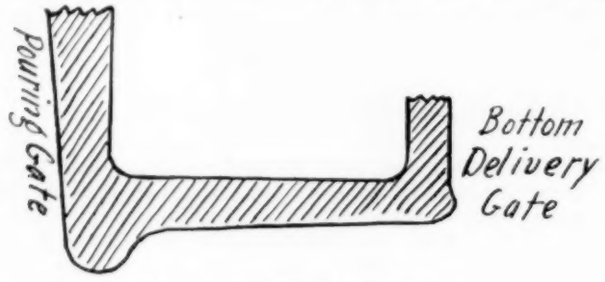


FIG. 47. MODIFIED HORN GATE

moisture, a marginal line between the dry and the green sand sets up and moves backward into the green sand of the mold. Under so much action and so much heat of metal either in point of time or intensity this crust will hold and then give way. It will either disintegrate by erosion or break or peel, buckle or scab along this marginal line either because the bond between the dry and the green sand has burned out or because steam pressure has generated so rapidly and of sufficient volume as to loosen and lift the dry crust above it. It is the rapid and voluminous generating of steam pressure and the inability of this pressure to escape the gackground mass of sand that causes many surfaces of sand both in green and dry state to buckle and scab in spots while the constant flow of great quantities of metal over the same pathways in those surfaces results in the sand disintegrating and washing away along those pathways. Any sand or sand surface will stand just so much heat and so much erosive action of flowing metal before the break down. And that is what happens when we deliver too much metal over any localized section of the mold or allow too great abrasive action of metal on that section.

The remedy is therefore plain. In all such cases deliver the metal from a main runner gate through a number of delivery gates judiciously placed, and so distribute the metal action rather than confine it all to one gate and one sectional pathway in the mold. In many instances and under many conditions the author has overcome cutting, washing and scabbing of castings in molds of broad flat surfaces and other forms of mold where these evils are peculiarly invited. When these multiple gates were of too small capacity to take care of shrinkage in the casting, he simply resorted to a riser for this purpose.

Another possibility in broad flat molds is to incline the mold in pouring from the level to an angle to the sprue, i.e., elevate the mold at the back and have the metal rise slightly up-hill in the mold. This checks the violence of the currents of metal and will often be found of value. Bottom gating the mold by the modified form of horn gate is another valuable consideration. The use of the green compound facing previously described is still a further excellent means of getting by the difficulty. Common molding practices such as nailing the surfaces of greatest flow, roughening these surfaces, etc., also number among the common-sense precautions in extreme cases.

Fifth. Where the metal or alloy used is especially inclined to cut and work the sand. Ordinary yellow brass will well illustrate. In heavy castings of this alloy green molds usually produce rough castings. The use of the green sand compound facing has been found by the author to accomplish much along this line.

Sixth. Where the pressures and weights of metal are beyond the green sand possibilities. This often occurs in deep molds where the bottom of the mold is an expansive flat surface. The use of a substantial dry slab core over this surface will often obviate a complet dry mold for the purpose. Another instance is where the pressures of metal are unequally applied or where it exists all on the one side of the sand unsupported as in those many cases where pools or basins of metal form in certain mold sections. Fig. 48 will illustrate. It is a large 600 pound copper casting used in rivet heating machines. If made in green sand and gated from the bottom at point A then the metal rising and confining all on the one side of green core C and flowing over the top of core C into the opposite side is full of the possibility of displacing the core by unequal pressure of metal as well as cutting or washing of the mold by the flow and agitation of the falling metal. But if bottom gated at points A and B then the metal rises equally and exerts equal pressures on both sides of the core and obviates the overflow and drop of metal, giving the casting a far better chance. In green sand these castings are satisfactorily molded by this gating method, it being of course understood that the feeding of the casting against shrinkage is taken care of in an entirely different way.

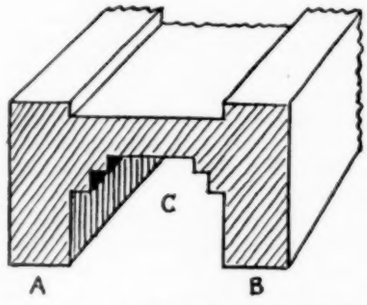


FIG. 48. 600 LB. COPPER CASTING

The above represent a few of the many cases or reasons for substituting the dry for the green mold. The author does not lean kindly toward trusting a green mold when a dry mold seems warranted. Yet in view of the greater trouble and expense of the dry mold, in every instance where he can make the green mold safe, he does not hesitate in the least to do it.

Regarding the dry mold itself it might be stated that it is of two kinds; the skin-dried mold and the mass-dried mold, representing respectively a baked surface crust and a baked condition throughout the mass of the sand in the mold. This skin dried mold is practically marginal to the green and the mass dried, and constitutes a medium by which the green mold can be stretched far. The subject will be further considered in connection with gases and here it is only necessary to remark that in either skin drying or mass drying sand molds the application of heat should be light and steady until after a surface crust has formed of sufficient depth to obviate a surface buckling of sand or a change of dimensions in the mold. Slow rather than rapid drying is the safe and logical procedure.

This series will be continued in an early issue.—Ed.

Methods of Handling Gold and Platinum Wastes

How to Recover Values in the Jewelry Factory.—Part II.*

Written for The Metal Industry

By C. M. HOKE

Consulting Chemist, the Jewelers' Technical Advice Company, New York

In the first chapter we discussed the different kinds of wastes occurring in the jewelry factory—high grade, low grade, etc.; the advantages and disadvantages of doing one's own refining; the differences between refining high-grade wastes like old jewelry, and low-grade wastes like floor sweeps; and the requirements for successful refining, which include disposal of fumes, space for the work, and a person of willing mind to do the actual labor.

In this and later chapters we shall describe the best means of disposing of wastes in case you cannot refine them yourself; and we shall detail fully the methods of refining typical kinds of wastes found in jewelry factories.

SELLING MATERIALS TO A REFINER

The United States Assay Office will buy old gold and silver from anyone; the material must be worth at least $100, and the precious metal must run at least as high as 20 per cent. This means that you cannot sell low-grade wastes, sweeps, etc., to the Assay Office.

Remember also that the Government gives no credit at all for the platinum-group metals. So if your material can possibly contain platinum, iridium, or palladium, either refine it yourself or sell it to a refiner who gives credit for these metals. When platinum was cheap they used to use it to alloy gold, and much old gold jewelry is more valuable than it looks; keep this in mind when selling it.

When sending materials to refiners, remember a few sensible rules. First, choose a refiner who is both honest and well-equipped. They are numerous enough, and it pays to keep away from the fly-by-nights and "shoe-string" refiners. With the introduction of platinum a host of so-called refiners have sprung up. Some are agents or collectors for larger firms, doing a legitimate business; others are poorly informed men, with a smattering of information, who may honestly believe they know how to refine, but who sometimes do more harm than good.

In selling to a refiner, the custom is to let him make a price on it, and if the price is not satisfactory he sends the material back to you. It saves trouble if the refiner can make his estimate (1) without destroying the identity of the material, and (2) without having to go to great expense to do it accurately. Therefore send in your material in such form as to make the refiner's work easy.

Thus, for material containing **no platinum.** Small lots of old jewelry, for instance, may be sent in as they are; but larger lots of five ounces or more, should be melted together into a button or bar. Here is the reason: it takes too much of the refiner's time to examine a lot of little pieces of gold; it is easier for him to examine a bar. The melting should be done well in order to make the button of the same quality all the way through. Then, if the owner is dissatisfied with the offer, the button can be returned, its identity not being lost. But if the refiner has to do the melting himself, the articles lose their identity and there is thus a chance for disagreement.

Now, suppose your material contains platinum and is being sold; it should **not** be melted together, no matter what its nature or quantity. Send it as it is—old jewelry, false teeth, filings, etc. In this form he has to examine each lot separately, but he can get a better idea of its value by this slow method than if the pieces were all melted together. There are two reasons for this: it is difficult to melt up mixtures of platinum and other metals; they do not alloy well, the platinum remaining in little lumps by itself, and the result is a bar that cannot be tested with any degree of accuracy. Secondly, even in a well melted bar the assay is not easy. Even if the scrap metal is all platinum, most refiners prefer to get it in its original form.

Often a seller of old metal entirely ignores the refiner's expense in making this estimate. Naturally this must be added to the cost of refining, and it is not fair to the refiner for the seller to forget it. At the same time it behooves the seller to send in his material in such shape as to minimize this as well as other expenses.

For example, the expense of refining depends largely on the amount of dirt that must be gotten rid of. By **dirt** we mean everything except precious metals; zinc and iron, rouge, emery, grease, etc., are dirt. If you have $1000 worth of metal mixed with a few pennyweight of copper and silver, it is easy to refine it. If it is scattered through half a ton of floor dust, old rags, paper, ashes, soap, etc., a moment's thought will show you that the refiner must spend money in making the separation.

Therefore keep down the bulk of your floor sweeps, old solutions, etc. Do not make the mistake of the man who soaked up a lot of old solution in a barrel of sawdust, because he did not wish to ship a liquid. He could easily have set the solution on the steam pipes for a few days and reduced it to a dry crust that could have been packed into a small wooden box. Instead he not only had to pay for the sawdust, but he also paid the freight on shipping it and the refiner's charge for getting rid of it.

If you are not sure how to prepare or handle any special kind of material, ask the refiner's advice; it is to his interest for you to get as much out of it as possible.

HOW TO CLEAN PLATINUM FILINGS AND SCRAP THAT CONTAIN NO GOLD

This is about the simplest job of refining that a jeweler can have. Properly done, it is the work of a few minutes and the result is almost certain success.

Unfortunately, if wrongly done the result is a very expensive and troublesome failure; and some workers who have done it wrongly have spread the news that the task is hard. Their error, however, lay in just one thing: They treated their platinum as though it were gold, and **started** work by melting the filings into a button. The correct method is to clean off the dirt first, and **finally** melt the cleaned filings into a button.

By following that plan, you have an easy job, and you get good metal.

The following instructions are copied almost word for word from a sheet that is supplied to purchasers

* Part 1 was published in our June, 1927, issue.

of a certain torch designed for melting platinum.

"Equipment needed for this work: A porcelain casserole, large enough to hold comfortably the amount of filings that you wish to clean. For 100 to 200 pennyweights a casserole 6 inches across is generally used. A magnet. A frying pan. A stove or heater. A glass funnel, a support to hold it, and filter paper. Two or three big glass pitchers or wide-mouth bottles. A glass stirring rod.

"Nitric acid. Chemically pure is best, and is not expensive. Caustic, in sticks, lumps, flakes or powder (also called lye, potash, caustic soda).

"Filings usually contain steel from the files, shellac, base metals, stones, paper, hair, sand, tobacco, plaster-of-Paris, emery, charcoal, and perhaps other kinds of dirt. These will be removed, and then the clean filings will be melted.

"If your filings contain much solder, or more than traces of gold, do not use these directions, since they do not tell you how to get rid of gold.

"(1) Remove iron and steel by passing a magnet through the filings.

"(2) If your filings contain much shellac, or much grease, boil them for several minutes in a strong caustic solution. Place them in the casserole, cover them well with water, and add some caustic.

"For 200 pennyweight of filings a half ounce or an ounce of caustic is generally enough. If your filings are very dirty, use more caustic. Bring the solution to a boil, and stir with the glass rod. (This caustic is bad for the skin, so do not get it on your hands. If you should spill it on your hands, wash them at once and they will not be hurt.)

"After the solution has boiled a few minutes, remove it from the fire, fill the dish with water, let the filings settle, and pour off the liquid, leaving the filings in the dish. Let this liquid settle well, and save any metal that you may have poured over; then throw the liquid away.

"Fill the dish again with hot water, to wash the filings. Stir well, then pour off this wash-water. Repeat until the filings no longer feel slippery to your fingers. Let the wash-waters settle before you throw them away, to be sure that you do not throw away any metal.

"If your filings contain only a little shellac or grease, they will not need to be boiled in caustic. In that case, simply burn out the wood, paper, etc., by heating them to redness in a frying pan. Stir well. It is rarely necessary to use both the caustic and the frying pan. Use one or the other, according to the kind of dirt there is present.

"(3) Next, dissolve base metals, such as brass, nickel, etc., by boiling the filings in nitric acid. **Do not** add any hydrochloric (muriatic) acid.

"The filings should be in the casserole. Pour on enough nitric acid to cover them well. Heavy brown fumes will appear; these fumes are poisonous, and very disagreeable, and will damage your machinery. So do this work outdoors, or outside a window, or near a good flue. The best and cheapest plan is to have an exhaust fan in your window.

"Add the acid slowly, or it might boil over. If there is much base metal, there will be many fumes. If there is very little base metal, there will be only a few fumes. Stir well with the glass rod.

"This may stand over night, or longer. But if you are in a hurry, heat the acid to boiling, and the base metals will all dissolve in a few minutes. Stir often, that the acid may reach all parts of the filings.

"Let the acid work all it will, then dilute it, pour it off, and either filter it through filter paper, or let it settle. It is best to use the filter paper and funnel. You may pour over some filings, and the filter paper will catch them. Let the paper dry and add to sweeps.

"Throw the acid away. Leave the filings in the dish. Add fresh acid, heat, and see if it changes color and gives off fumes; if so, that means that there are still base metals for the acid to work on. Stir well.

"Continue this treatment, until there is no more action between the acid and the metal; that is, continue until all base metals are dissolved.

'Wash off the acid carefully with plenty of hot water. Wash several times. Then let the filings dry. If these directions have been carefully followed, the filings can be melted with the oxy-gas blow-pipe.

"Some people use aqua regia on their platinum filings. Aqua regia is any mixture of nitric acid and hydrochloric (muriatic) acid. It always dissolves some platinum, no matter how you mix it up. Therefore, do not use aqua regia on this kind of filings, unless you expect to recover the dissolved platinum.

Palladium

"Pure palladium, or platinum that is alloyed with 50% or more of palladium, must not be treated by this method. That is because palladium dissolves easily in nitric acid.

"So, if your metal contains much pure palladium or platinum alloyed with 50% or more palladium, special directions are needed. But if your platinum is alloyed with only a little palladium,—say, up to about 25%,—these directions are all right.

"In melting platinum that contains palladium, work the same as with regular platinum, except that you do not need so hot a flame. The palladium tends to make the hot metal spit and pop out of the crucible. After all your metal is molten, let it cool SLOWLY, by moving the flame away from it and turning the oxygen off slowly, so that it will solidify slowly with the gas flame playing on it. That will give you a good button. If the button is rough, heat it again until it just runs smooth, then turn the oxygen off and let it cool slowly in the gas flame. While still hot, drop it into water and it will have a better color.

"If your filings contain much sand, glass or enamel—

"Place them in a lead or platinum dish, and cover them with hydro-fluoric acid. This acid dissolves glass, sand, enamel, etc. Often the same acid can be used on two or three lots of filings. If you are in a hurry, heat the dish, remembering that if you use a lead dish you must heat it very carefully or it will melt. A sand bath is the best way to heat the dish. Do not breathe the fumes, as they are very disagreeable and bad for your throat. If you get any of this acid (or the nitric acid) on your hands or clothing, wash it off promptly with plenty of water and it will do no harm.

"The hydrofluoric acid is kept in wax bottles, as it dissolves glass.

"Finally wash the acid off the filings with plenty of hot water, and let the filings dry. Look over them carefully, pick out any stones, bits of gold, etc., and if they are clean, melt them with an oxy-gas melter.

"The acid does not get rid of emery. The emery remains mixed with the filings, but when you melt them the emery simply melts and runs to one side of crucible. Generally it causes no trouble."

In another chapter we shall discuss fully the methods of refining gold wastes, and indicate the plan for handling the more interesting mixtures of gold with platinum, palladium, and iridium.

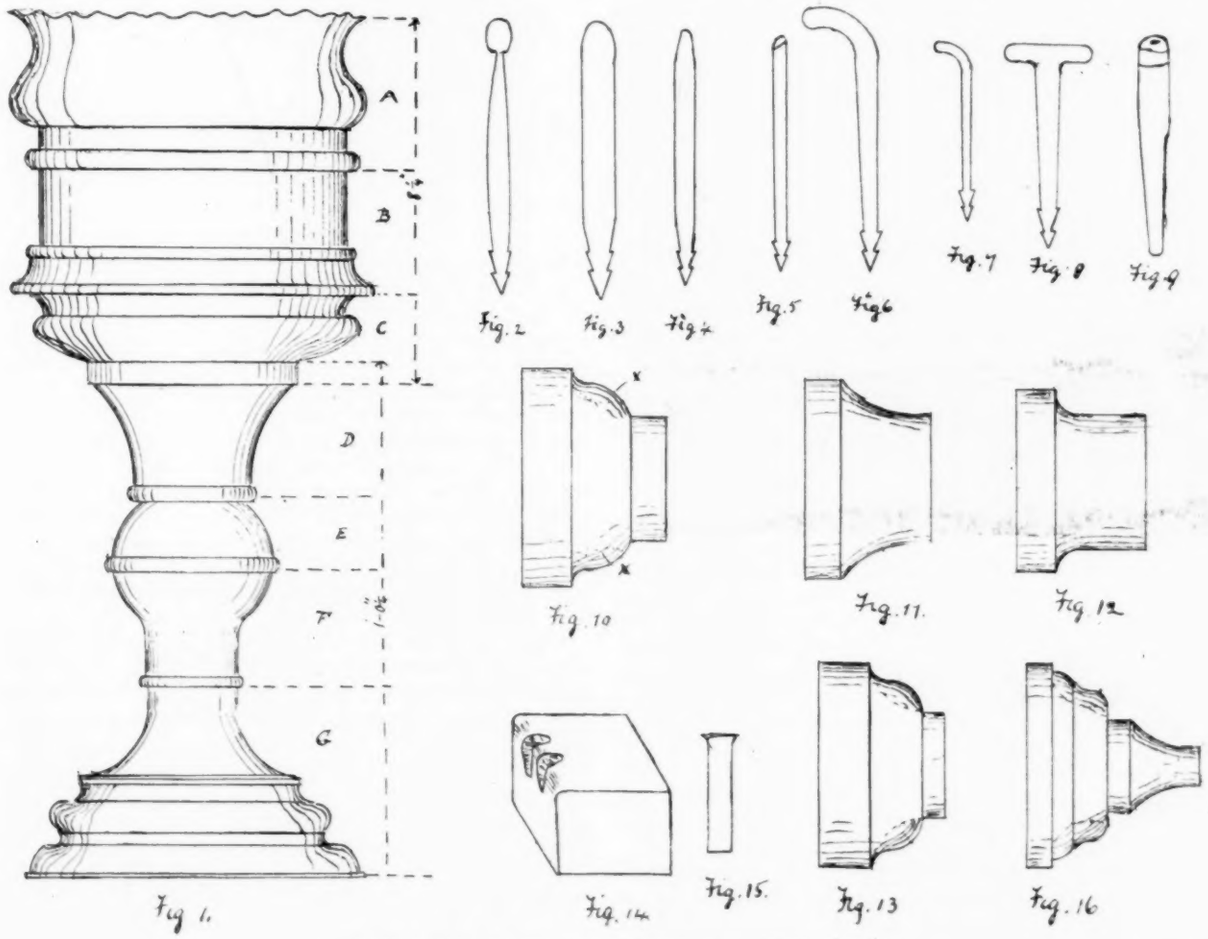
Metal Spinning

How to Make a Fern-Pot and Stand in Spun Copper

Written for The Metal Industry by WILLIAM MASON, Metal Spinner

The fern-pot, Fig. 1, should be spun in three pieces, and the stand in four pieces, and then lapped together. The pot should be detachable from the stand, so that it can easily be taken off when required. No soldering of any description is required. The chucks used for this kind of work are of beech or sycamore, and the lathe and rest should be strong. The spinning tools required are illustrated by Figs. 2 to 9. First take a piece of sycamore the size required for spinning the top of the pot A, and drill it rather smaller than the thread on the "false nose," so that when screwed on the "false nose" it will have a good thread on it, and consequently be firm. Then turn with an ordinary wood-turning tool to the shape shown in Fig. 10. Next measure round the chuck to find out what size circle is required to spin it, allowing a little for the stretching of the copper. After cutting out the circle in copper, take a piece of hardwood, called the centre-wood, the same size as the bottom of the chuck, and insert the copper between the bottom of the chuck and centre-wood, screwing the back-centre up against it to make it secure. Now throw on the band of the lathe, and make the copper true, which is very easily done with the aid of one of the spinning tools, Figs. 2 to 9, held firmly on the rest between the edge of the copper and the rest-peg, the back-centre being gently released till the copper is quite true. Screw up the back-centre again firmly, and the metal is ready to be spun into shape. First lubricate the copper with a piece of cotton-waste which has been saturated with oil; then take the spinning tool and spin the metal about half-way on the chuck. This done, the metal should be annealed and dropped in water while hot, as this method clears the scale from the copper. Spinning being resumed, it will be found to spin quite easily down to the chuck; then, turning away part of the chuck as shown by dotted lines X, Fig. 10, the spinning can be hollowed to the exact shape required. Next cut out the bottom with a 3-square cutting tool, pointed, and lift up a bead at the edge, as shown by dotted lines, with a small hook spinning tool. There is no more to be done at present to part A.

The part B should now be taken in hand. The chuck for this should first be turned as shown in Fig. 11; this is called a drafting chuck, and will not stretch the copper so much as turning it, to the correct shape required, which is very straight, and great care is required to keep the copper an equal thickness. After spinning it down on this chuck, anneal it and turn the chuck, as shown in Fig. 12. Finish spinning, cut out the bottom, and lift up the bead with the hook tool indicated by dotted lines to fit inside the part marked A, Fig. 1. It should now be



TOOLS AND PARTS FOR SPINNING A FERN POT

reversed on a chuck, and the bead lifted to form the other one shown on part B.

The next part to be spun is the bottom of the pot, C, first turning the chuck as shown in Fig. 13. This part should be spun about half-way and annealed, but no drafting chuck is required. After spinning it on to the chuck, turn the chuck away, as shown by dotted lines Y, Fig. 13. It can then be hollowed easily with a small hook tool, and sharpened up with the edge of the spinning tool, Fig. 4. When this part is finished it should fit in the largest edge of part B.

The spinning of the fern-pot is now complete, and is ready for lapping together. To accomplish this, fit part A tightly on a chuck, add parts B and C in proper order, and put a centre-wood against them; then screw the back-centre up to them gently, so that they are firmly held together. Throw on the band of the lathe, take the spinning tool, Fig. 5, and lap all three together tightly. The pot should then be crimped round the top edge, an operation which not only improves the appearance, but hardens the edge, and so makes it stronger than it otherwise would be. To do this, take a small block of hardwood, boxwood preferred, and file off one corner till it is the same shape as the top of the pot. In the wood file two hollows, as shown in Fig. 14. Next make a small punch fit in the hollow; let the top edge of the pot rest on the rounded edge of the wood, use the punch, Fig. 15, and a light hammer, and the necessary crimped edge will be obtained.

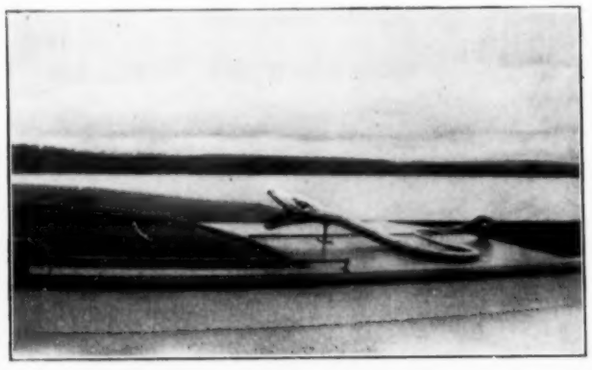
In spinning the stand, the foot G should be made first, the chuck being turned as in Fig. 16. In this case it will probably be necessary to anneal the metal twice. After spinning on to the chuck, turn over the edge and lap closely with the spinning tool, Fig. 5, as shown, then turn the chuck away to the dotted lines Z, and hollow in. Next cut out the bottom, and lift a very small bead on to it with a hook tool. The neck part of the spinning should now be put in an inside chuck and a bead lifted up, as shown, then reversed again on to the outside chuck, and sharpened up each side of the bead last lifted up with the edge of the tool, Fig. 4. The parts D, E, and F are very simple, and do not need explanation after the instructions already given for the making of the other parts. It may be remarked, however, that the bottom of the pot should not fit too tightly in the large end of part D. When all four parts that compose the stand are spun, proceed to put them together. First fit part D on a chuck, and lap it to part E; then add F, and lastly the foot marked G.

The work is then ready to be polished and lacquered.

Venetian Boat Horn

Venice and Venetian art are renowned all over the world, and the motor boat horn shown in cut indicates how this artistic spirit is applied even to the equipment of summer pleasure craft. A horn in the shape of the fabled sea serpent or actual boa constrictor, that is made of brass or steel, nickel-plated, and that gives a sound which does not jar the ear, is certainly a unique idea and shows the originality of European art metal fabricators.

The serpent suggests the thought that motor boat horns might be made in the shape of various sea creatures, such



SERPENT SHAPED METAL HORN

as sea lions, porpoises, dolphins or the imaginary sea nymphs, such as mermaids. For inland lake and river craft, motor boat men might prefer lake trout, water snakes or Florida alligators. Then there is the great variety of birds such as eagles, ospreys, gulls and loons.

For the modern vehicle of the land—the automobile—which also must have some sort of an audible signal, and has a radiator cap subject to ornamentation the eagle is also suitable; also the hawk and the owl, saying nothing of countless other land birds. Or if people prefer larger specimens of the animal kingdom, why not the great American bison or moose, elk, deer or bear?

It is possible that American manufacturers would not think that clarions and caps of such fantastic shapes are practical and that they will continue to produce those of standard forms. However, the idea of bird, animal and reptile—shaped metal horns and caps may be worth consideration.

An examination of the serpent shown in the illustration after a season of service on Moosehead Lake, Maine, in the motor boat Spiffy, owned by John Curtis of New York, showed that the horn was still bright and evidently had a good plate of nickel. Though the device was bought in Venice, Italy, the inscription upon it of Streib, patent 355 R., might indicate that it originated outside of Italy.

Dip Brazing

Q.—We are manufacturing brass rod brazed to a malleable casting, also steel tubing brazed to casting, using a gas torch. Can you furnish us with full information in regards to what apparatus is necessary for dip brazing?

A.—Generally speaking all that is necessary is a suitable crucible that will take care of the work for immersion in the melted spelter and a furnace for melting it. An ordinary metal melting furnace of the crucible type answers nicely. The top can fit more closely because the crucible does not have to be lifted out. The smallest size crucible that will handle the work to be done should be selected, to save both fuel and the necessity of melting such large quantities of spelter as the crucibles must be kept nearly full all the time.

Use long grain lump spelter and any good borax flux. After the spelter has been melted slowly pour enough of the flux on top to make a layer of from 1 to 1½ inches deep. Hang the pieces to be brazed on hooks of low carbon steel which can be dipped with ordinary tongs, being completely submerged in the molten spelter. The work must remain in the metal until it has had time to become as hot as the spelter. It should then be taken out and shaken briskly so as to remove the surplus metal which might form heavy lumps. Experience counts greatly in dip brazing, one great precaution being to be sure that the parts to be brazed are perfectly clean and free from dirt and grease.—P. W. Blair.

Notes on Chromium Plating

From the Monthly Review of the American Electro-Platers' Society

by F. R. PORTER,
Edison Electric Appliance Company

The following contribution on chromium plating covers the more important parts of our experience, using a solution of the type now generally recommended, on an experimental basis over a period of several months.

SOLUTION USED

The solution used was made up of:
Chromic Acid—CrO_3—16 to 32 oz. per gallon.
Chromium Carbonate—$Cr_2O(CO_3)_2$—1 to 2 oz. gal.
Chromium Sulphate—$Cr_2(SO_4)_3$—⅔ to 1 oz. per gallon.
This is the solution used by the Bureau of Standards and is the type of solution now generally recommended for chromium plating.

CHEMISTRY

The function of each constituent of the bath is assumed to be as follows:

Chromic Acid—Chromic acid is the main constituent and supplies the chromium ions for deposition. It was probably first used by Buff in 1857 in conjunction with sulphuric acid. Placet and Bonnett also made use of it together with organic acids about 1890. In 1906 LeBlanc reported at a meeting of the American Electrochem. Society results of experiments using chromium sulphate and chromium hydroxide. Bancroft at that time pointed out that the chromic acid bath was the practical one to employ. Since that time chromic acid has been the main constituent of the majority of solutions.

Chromium Carbonate—Chromium carbonate or hydroxide is added to the bath to control the acidity. It forms chromium chromate, a trivalent-hexavalent compound which acts as a buffer to keep the acidity practically constant. Maus was probably the first to discover chromium chromate. He found in 1827 that chromium sulphate or chloride treated with chromic hydroxide in presence of chromium trioxide produced chromium chromate. Franz Salzer, about 1908, pointed out that chromoxid (chromium chromate) $Cr_2O_3(CrO_3)_3$ could be prepared by partial reduction of pure chromic acid—electrically or chemically—or by a partial saturation of chromic acid, with chromium hydroxide. He was granted a patent, U. S. No. 900,597—covering a solution containing chromic acid, chromoxid and an electrolyte. This is essentially the composition of the majority of solutions recommended at the present time. LeBlanc was perhaps the first experimenter to use chromic hydroxide for controlling acidity. He reported in 1906 that this compound had been used in the cathode department of his experimental cell to control the acidity with good results.

Chromium Sulphate—Chromium sulphate in the plating bath acts as the "carrier" for the chromium and it is from this compound that the metal is actually deposited. It is supplied with chromium by cathodic reduction of the chromic acid.

OPERATING CONDITIONS

Temperature—Temperature was found to play an important part in the character of the deposit obtained. A bright deposit could be obtained over a wide temperature range, but the most satisfactory temperature was found to be from 40° to 46°C (110 to 115°F.). At much lower temperatures—32°C (89.6°F.) for example, the deposit while bright was spongy as evidenced by the difficulty in wiping off finger marks and spots.

Current Density—The current density within limits was not found important except on pieces of irregular shape. Parts with plane surfaces were readily plated at from about 70 to 350 amperes per sq. ft. However, on parts of irregular shape in general from 200 to 250 ampere per sq. ft. were required to obtain a continuous deposit. At lower densities no deposit would be obtained on the recessed parts.

Anodes—Both lead and steel anodes were used. Better results were obtained with the steel because they were not so readily attacked and coated with chromium salts. It was found necessary to carefully control the amount of anode surface for good results. Too much surface resulted in gray deposits along the edges of parts. Insufficient anode surface resulted in a non-continuous deposit. Best results were obtained when the anode surface was about one-half to three-fourths the cathode surface.

Composition of Bath—It was found that the quantity of chromic acid in the bath had practically no effect upon the deposit within the limits used (16 oz. to 32 oz. per gal.). Likewise the quantity of carbonate present had little or no effect. The sulphate, however, caused trouble unless carefully controlled. More than 0.4 oz. per gallon resulted in reducing the apparent throwing power.

Racking—Racking was found to be a very important part of the process. The usual racks for nickel and copper plating could not be used. Special racks of heavier construction were necessary and were so made that positive contact with the supported part was assured at all times. For some parts it was found necessary to construct a rack in such a manner that the parts could be rotated while plating.

In connection with the subject of racking, it is of interest to note that more consistent results were obtained by immersing the parts in the bath before making contact rather than having the contact made when the part entered the bath as is the generally accepted procedure. Brass parts of irregular shape have been immersed in the bath for a period of five seconds before making contact and yet a satisfactory bright deposit obtained.

PROTECTIVE VALUE

Corrosion—As is generally known, chromium plate when applied on steel does not give as much protection as the same thickness of nickel plate. It apparently is a more porous deposit than nickel and accelerates corrosion of the steel where exposed. The accepted manner for applying chromium to steel where protection against corrosion is desired is to first apply a coating of sufficient thickness of nickel or copper or both and then deposit chromium on this. Recently a sample of chromium plated steel was submitted to our laboratory for test. It withstood the salt spray for approximately 60 hours before showing signs of corrosion. An analysis of the coating showed it to be composed of a buffed layer of nickel plate 0.001" thick upon which a bright chromium deposit of 0.0004" had been deposited.

Oxidation at High Temperatures—Considerable work has been done in our laboratory in attempting to obtain a chronium deposit on steel that would protect it against oxidation when used at temperatures of 1400 to 1500°F. The results have been discouraging as only one

deposit has been obtained which stood up for more than 300 hours and the majority failed within 48 hours. The majority of failures occurred by the coating peeling and cracking off due apparently to oxidation of the steel under the coating. This was due no doubt to the porosity of the coating. More satisfactory protective coatings of this sort are obtained by applying the chromium over a deposit of nickel. However, coatings applied in this manner have not proven entirely satisfactory, the best of them having a life only approximately one-fourth that of a calorized coating, for example.

Tarnish—It is quite generally known that chromium plate is not subject to oxidation at atmospheric temperatures (tarnish) under the usual conditions. Where nickel plate quickly tarnishes, chromium plate remains bright indefinitely or at the worst can be easily made bright by wiping with a damp cloth. It is this property above all others that has brought chromium plating to its present status. Automobiles, hardware and manufacturers of plumbing fixtures are becoming interested in chromium plate because of this property.

COST

The cost of chromium plating will depend upon the class of work being finished and the class of finish. In general it may be said that it will be somewhat higher than for nickel plating, especially so for steel parts where nickel or copper is first applied. It is not yet applicable to barrel plating so that such parts as screws, ferrules, springs, etc., that are nickel finished at low cost in this manner would have to be chrome plated by the more expensive steel tank method. The metal cost of equal thickness is only slightly more while power costs are at least five times more for chromium.

In summing up, it may be said that chromium plating is yet in the development stage; that it requires the attention of a plater of more than average ability if consistent results are to be obtained and that in general, it is more costly than nickel plating.

DISCUSSION

Q. No. 1. How long can you run those in the electrolight and maintain a bright deposit?

A. No. 1. We have never run the parts long enough to get a dull deposit, but we have never run them particularly to find out how long we could run them. I would say off-hand that they could be run longer than a nickel plate, because a nickel plate in half an hour or so begins to get gray. But I don't know how long they could really be run.

Q. No. 2. How long have those people run them?

A. No. 2. Those parts (referring to the samples shown) have only been run about two minutes. On a brass part a two minute deposit on an ordinary buffer won't cut it through, using a white line composition.

Q. No. 3. Why does the brass show around the ends?

A. No. 3. Because it didn't deposit. I have a little tube half inch in diameter that we plated at about seventy, and I think that is about as good as any we have seen.

Q. No. 4. I would like to ask whether they were done as a sample or as "production"?

A. No. 4. As experimental work. About a year ago we were of course interested and had work done outside by many companies, and some was satisfactory and some was not; but we went into the experimental end of it to see what we could do toward putting in an experimental plant. But those parts were made for experimental work, and not for production.

Q. No. 5. Have you tried plating on a chromium plate?

A. No. 5. It won't stick on a chromium plate.

Q. No. 6. I would like to ask if any excessive chromium carbonate has any detrimental effect on the chromium plate?

A. No. 6. We found that it had no effect up as far as we have gone, and that was the limitation of about four or five ounces per gallon. We couldn't see that it helped it a particle either way. Two (2) ounces per gallon was as high as we went, but it had no effect.

Q. No. 7. With reference to the character of the deposit, do you find that you get just as good a deposit without the use of the chromium carbonate?

A. No. 7. We used chromium carbonate at the start.

Q. No. 8. What voltage did you use?

A. No. 8. We played around a while with six (6) volts, and got good results as long as there weren't too many pieces on the line, but then we raised to nine (9).

Q. No. 9. What experience have you had with screws?

A. No. 9. We had to rack them and plate them "still-tank" in the regular way.

Q. No. 10. Will they plate in the slot?

A. No. 10. Yes, provided your slot isn't too deep. The screws we experimented with were quite small.

Q. No. 11. In plating screws would you rack them in perforated plates?

A. No. 11. If doing it in production, I believe I would see that they had as little metal exposed as possible, because you could do it quicker.

Q. No. 12. If you were using a perforated plate to rack screws on, how wide could you use that plate so that all those screws would get a deposit?

A. No. 12. That would depend upon the size of your tank, and the size of your anode. As far as we could find we could fill the tank up pretty well and get a plate on it.

Q. No. 13. If you were going to plate screws in racks you could not place very many because those in the center would get absolutely no deposit. Have you had any experience with that?

A. No. 13. Yes, we did, but we finally worked out a method of racking where we could use several racks at a time and cover all the parts. Here are some examples (Shows samples.)

Q. No. 14. The gentleman said that there was one part of that piece that he couldn't plate. Which part was it?

A. No. 14. The center. The distribution of current was so poor that the upper piece plates, the lower would plate, but the center would not plate.

Q. No. 15. I am speaking of the large piece, the part where the perforations are, down between the top and the outside rim.

A. No. 15. We use only the stationary anode, facing the part.

Q. No. 16. Are those parts buffed?

A. No. 16. They are not buffed.

A. No. 16. By speaker: We can get a plate at the top at a slant, and then by turning it we could plate it. I cannot explain why it wouldn't plate by lowering it, but it wouldn't.

No. 16. I think I can answer that question the gentleman asked. We find that if we invert it and just turn it upside down and use the bottom of the tank as an anode you will get a deposit all over.

Q. No. 17. Do you have an anode on the bottom of the tank?

A. No. 17. We use the steel tank, and the tank is the anode.

Remark No. 18. Chromium plating is interesting to every plater in the United States. But it seems to me before we can go very far the situation as far as patents

are concerned must be brought to better understanding of what is a "chromium patent."

We know that it doesn't make any difference what solution you use, that the Sargeant solution is still the basic solution, even though we add boric acid to produce bright, white, lustrous coatings of chromium.

Now, then, what are we going to do about it? We know that we can plate with that solution, and I can tell you that within a hundred miles of Chicago they are plating thousands of parts in a chromium solution and getting results. They are getting results because they have the "solution." A good deal of the solution problem of chromium plating is to get an anode that will reduce to a certain extent and control the free acid that flows in your solution. You can plate with anodes if you have the "solution" correct. It makes no difference whether 16 oz. or 34 oz. of chromic acid are used. You can plate with 16 oz. solutions just as good as you can with a 34 oz. solution. I was in a plant just recently where they were plating several hundred locomotive headlight reflectors, and they were using a solution of 20 oz. of chromic acid, 1.4 oz. of chromic sulphate, and 1.5 oz. of boric acid.

Chromium plating is still in its infancy, but we have got to clarify the atmosphere before we can make it successful, because we know that big interests are trying to control "chromium" as they did "cadmium" plating. If we all stand together we can make chromium plating what it is and what it should be in the commercial industry.

Remark No. 19. I had the pleasure of watching an operation under Mr. Porter's supervision, and I noticed in plating one of those large discs that one came out with the gray streaks around it, and I found out that the fellow put that on where the cathode rod wasn't clean, and it didn't get as much "juice" as it ought to.

Q. No. 20. You might take a piece out of a chromium solution perfect and may want to introduce it into the bath again and expect to take it out covered evenly, but instead of that you have blotches all over it. What is the reason for that?

A. No. 20. I don't know.

Q. No. 21. The speaker stated that a small anode surface was more advantageously used than a larger anode surface?

A. No. 21. What we were driving at was to get a solution and a process that we could apply to our own particular product, that would be inexpensive, and with the Bureau of Standards solution we found that unless the anode surface was controlled the parts came out with gray deposits on the edges.

Q. No. 22. You would say that an excess anode surface would cause that?

A. No. 22. Yes, that is what we found.

Cadmium Solution

Q.—How can I get a solution for cadmium plating? What are the patented processes?

A.—There are several patents covering cadmium plating solutions as you will have noted in reading THE METAL INDUSTRY. Still cadmium can be plated commercially with the following solution:

Water	1 gallon
Sodium cyanide	7 ozs.
Cadmium oxide	3 ozs.
Caustic potash	2 ozs.
Black molasses	½ oz.

Anodes, pure cadmium; temperature of solution 80 to 100 deg. F., voltage 5 to 6. The solution should be prepared in the order given, using ⅓ of the water first to dissolve the sodium cyanide and cadmium oxide heated to 160 deg. F., then add the balance of water cold; then the caustic potash and molasses.

If you desire absolute protection, you will have to obtain license to use the patented processes.

The cadmium mercury deposits patented by the Roessler and Hasslacher Chemical Company, New York, include anodes of 98-99% cadmium, and 2 to 1% mercury. The other patentees are Udylite Process Company, Kokomo, Ind., and Grasselli Chemical Company, Cleveland, Ohio.—C. H. P.

Bronze on Copper

Q.—Kindly furnish us with formula for oxidizing solution for giving bronze finish to copper plate.

A.—Statuary bronze is produced on copper by immersing in a solution of sulphuret or polysulphide or liquid sulphur, etc. (⅛-¼ oz. per gallon), until a purplish iridescent shade is obtained. By scratch brushing, wet or dry, a beautiful brown tone is brought out.—J. H.

Old English Finish

Q.—We are sending you a sample socket finished in Old English. Can you kindly advise us the best methods of obtaining this finish starting from an unfinished surface on brass? We are not satisfied with our present method.

A.—The socket must, of course, first be buffed with Tripoli, so that it has a semi-bright lustre. After cleansing the socket in boiling alkali solution and rinsing in water, immerse in a warm solution of barium sulphide ½ oz., water 1 gallon, until a brown tone is obtained. Rinse in water, scratch-brush wet and re-dip to even tone. Rinse in cold water and immerse in boiling hot water and dry. Then with a moist sponge that has been rubbed over some sodium cyanide, daub over socket. This will remove the brown and reveal the brass, giving the mottled effect. Drop each socket as finished into a basket in cold water. When basket is filled, immerse in hot water and dry. Dry scratch-sockets and lacquer.—J. H.

Nickel on White Metal

Q.—We are having considerable trouble with our nickel plating of white metal. If possible we wish to copper plate the metal first. Will you please advise us as to what copper solution would be most suitable for plating the white metal, and as to the best way to prepare the metal for plating?

A.—If your white metal is die casting or antimonial lead, copper plate in cyanide copper solution.

Water	1 gallon
Sodium cyanide	4½ ozs.
Copper cyanide	4 ozs., 2 to 3 volts
Sodium carbonate	2 ozs.

If the metal has been buffed, clean in kerosene and dry in sawdust. Then immerse in a hot solution of a mild alkaline cleaner. Rinse in clean cold water, cyanide dip, rinse in cold water and copper plate.—J. H.

High Lights on Japanning

History and Development of This Old Art

Written for The Metal Industry by WILLIAM J. MISKELLA, Consulting Engineer, Chicago, Ill.

The japanned finish is one of the most important that is available to those who wish to decorate, preserve or protect the articles they manufacture.

Japanning has always been more or less mysterious. The men who had any knowledge of it at all kept what they knew to themselves. Indeed, I have known of instances where japanners have even lied to customers, and others seeking information about their particular specialty. It is customary to see the sign in the office of a japanning shop—"Positively NO ADMISSION to the SHOP." Possibly the practice started centuries ago. At any rate, the japanners of today who display such a sign are not really responsible for doing so. They do it because those who went before them did it.

ORIGIN OF JAPANNING

During the third century, when Korea was still a part of China the Japanese visited the island and learned of the lac tree. It was interesting to them and they took some back to Japan. When the trees grew large enough to give off their liquid, it was commercialized and various kinds of lacquers made from the sap. Lacquers known as Chinese, Japanese, Pekin, Foochow, Cinnabar, and so on were available long before the eighteenth century.

It is important for the reader not to get this kind of lacquer confused with the pyroxylin lacquer of the present day. There is no connection whatever between them. Pyroxylin lacquer is primarily an American product made chemically from such raw materials as cotton and corn. The cotton is nitrated and chemically treated after which certain solvents are added and the result is the lacquer that is so popular today.

Lacquers from the lac tree of Japan and China are known as oriental lacquers, and by right, the term lacquer belongs to them. However, long before anyone foresaw that we would some day have a great lacquer industry in this country, manufacturers were careless in choosing terms to describe their products without first looking up a little history of the term adopted.

These original oriental lacquers that were made from the sap of the lac tree were applied by the Chinese and the Japanese in as many as thirty or forty coats and the finishing process extended over a period of six months. Naturally, this state of industry could not have existed were it not for the fact that the labor of that day was very cheap and little was known about production methods such as we see today.

During the eighteen century the Europeans began to imitate the finishes using copal varnish and to the product seems to have been assigned the name, Japanese Varnish. Later on this was shortened to Japan Varnish and still later the varnish part of the name was dropped, leaving only the word Japan.

One of the oldest United States patents that I have been able to locate was taken out by John J. Howe and Truman Piper of Derby, Conn., June 10th, 1856, and was assigned to the Howe Manufacturing Company. This interesting patent covers the japanning of pins, and reads just as if it were taken out yesterday except the older term Japan Varnish is used instead of the modern term japan.

CHARACTERISTICS OF JAPAN

Japan is often erroneously called paint and is mistaken for paint, even by men who use it. Paint consists fundamentally of three ingredients; a pigment to give it color; a reducer to condition it, such, for example, as benzine or turpentine; and an oil to give it life. This oil, by the way, is classed as a drying oil of which linseed and China wood oil are examples. These three ingredients are thoroughly mixed together. After the paint is applied to the surface to be covered, the oil begins to harden, which may take up to five years, in some cases—even longer in a few special cases. The point is that the oil in the paint is its most important part.

Japan also consists of the same three general ingredients but the pigment in it is a gilsonite, a member of the asphalt family. In fact, japan is the only liquid material that gilsonite is used in. The great distinction comes when the japan-coated articles are placed in a japanning oven and the burners are lighted. Gradually the heat rises and the smoke begins to come out of the chimney, which indicates that the oil is being burned out.

After the oil has disappeared there remains on the surface of the metal only the gilsonite that was taken out of the mine originally. Theoretically, nothing will ever happen to this japan coating. It will not deteriorate like paint or lacquer. In fact, any change that takes place in it must come from underneath. Only rust or some other form of corrosion on the metal will take place on the surface of the metal itself, but this will not affect the japan coating. The coating will be raised and may fall off but the japan itself will not be affected or deteriorate.

One may select an old properly japanned piece of metal that has been thrown out in the scrap heap and exposed for months to the rain, wind and snow, and if the metal has not become affected by rust and the outside surface of the japan coating still remains intact, it will be possible to polish the exposed surface of the japan coating and bring back a lustre that will be equal to that possessed by it originally.

Many people who work with japan think that a hot lye solution will dissolve the coating on an article that is to be refinished. There are the many so-called japan coating materials on the market and it is not strange that many of them do not stand up under severe tests. This means that when a supposedly japanned article is placed in a hot lye solution for several hours, the coating is said to dissolve.

Theoretically, the hot lye attacks the surface of the metal and actually does not have any real effect upon the japan itself which comes off as a whole in pieces sometimes as large as six square inches. There is no other kind of a coating material that will stand the severe test of being placed in a hot lye solution for several hours and still remain in part on the old surface.

It is interesting to note that gilsonite, which is taken out of the ground and shipped directly to the manufacturer of japan without any further treatment, is immediately placed in a kettle together with some linseed oil and heated at a high temperature. It is at this point that the oil and the pigment go into solution and form a very close friendship that is not disturbed until they are parted by the heat inside of the japanning oven.

Japan does not settle or separate like most paint materials. It holds its viscosity indefinitely and changes slowly only as the benzine reducer, that is used with it, evaporates. When a reducer is added to a japan solution and is properly incorporated it immediately becomes

a part of the uniform solution. The only noticeable physical change will be a thickening of the solution. However, there will be no settling and the material when placed in a barrel or a drum will be just as uniform after several years as it is the day it is placed in the barrel.

There are many ways of applying japan but the most popular method of application is dipping. It is hard to believe that one may, for example, dip an automobile fender into a large vat of japan and have the fender properly covered with no further labor than that of merely hanging it up to allow the surplus japan to drain off. Yet, that is all that is done. The great majority of automobile fenders are dipped twice; that is, they receive a first coat and are baked, after which they are dipped a second time and again baked. Some of the higher class fenders receive three treatments.

I often marvel at the careless way in which our men handle work that is being given a japanned finish. They dip a half-dozen parts at one time and spread them out after they reach the oven racks. No attempt whatever is made to keep them separated until after they reach the oven. Finger marks never show on the japanned work turned out in a shop or department that has the right "know-how."

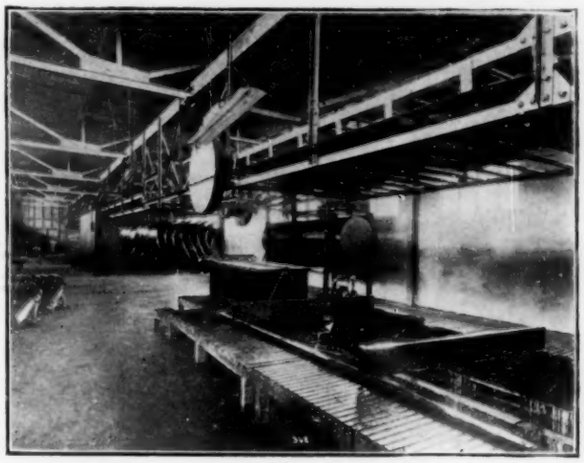
JAPANNING OVENS

The evolution of japanning ovens has been most interesting to me. When I first came in contact with the baked finishing idea, over twenty years ago, it was customary to have the work carried into an improvised oven piece by piece. The oven of that day had either a large stove in it, to furnish the heat or it was equipped with two long gas burners located along the sides of the oven near the floor. Quite often one would hear of a japanning fire or an oven that had exploded and it would be the thing to drop whatever task was being executed and rush out to the fire to learn at the expense of the other fellow, some new fact that might prevent us from duplicating his misfortune.

It is not surprising that there were many serious fires and many, many deaths caused by meager knowledge of the equipment and the materials that the japanner of the early day had to deal with. In fact, it is a wonder that the casualty lists were not much longer. The production demands of the great American automobile industry were directly responsible for forcing better oven designs and better methods of handling. I often wonder what the finishing room of the automobile plant of today would have been had not the wonderful advance steps in the japanning industry been made in time to take care of the finishing as fast as it was sent into the various large japanning departments. At one time, the "bottle-neck" of a production plant, where anything in metal was manufactured and finished, was certain to be in the finishing department.

In a plant where very large production is demanded it is customary to use a continuous type conveyor which passes through the two or three ovens as the case may be. Here the parts bake as they move. But in the intermittent type shown they are carried into the oven in blocks of forty or more as stated above. After the fenders in a block are dipped and baked they are moved along to the next operation and so on, continuing for eight, sixteen or twenty-four hours, depending upon the production demands on the finishing department.

It is interesting to note that the oven, once it is heated, can handle the loads very fast—just as fast as it is possible for the dippers to load the conveyor. Recalling again the old box type of oven, the work had to first be placed in the oven, which naturally had to be cold so that the workmen could carry in the parts. After the load was ready to be baked it took considerable time for the oven itself to reach the required temperature. In my own plant I am able to get on an average a load every twenty minutes with an intermittent conveyor. Were I to do the same work using a box type oven it would be necessary to run a heat about every two or three hours. Obviously, there would be a very great loss of heat which



JAPANNING AUTOMOBILE FENDERS

is saved in the use of either an intermittent or a continuous conveyor type of installation.

In the illustration is shown the japanning department of a plant that makes a specialty of automobile fenders. The first coat unit is shown at the left. The fenders, after being cleaned, are dipped and then hung on a conveyor. Soon thereafter they are carried into the oven, forty at a time. After they are baked they are carried out of the oven in a group or block, into the finishing room where they are all ready to be taken off the cross-rods that carry them. They are then dipped a second time in a large vat as shown in the middle of the picture. After this second dip they are hung on another set of cross-rods and allowed to drain for a few minutes.

As soon as the second-coat oven temperature rises high enough to complete the baking of the load in the oven, the doors are opened at both ends of the oven and the conveyor, which is operated by a reducing gear, similar to the one shown in the centre of the picture near the mercury vapor light, carries the parts out of the oven.

It is very common for an installation of this kind to produce forty single coat finished fenders every twenty minutes or one hundred and twenty fenders per hour. The oven has a baking compartment six feet wide, six feet high and sixteen feet long. The conveyors shown here are known as the intermittent type.

Bright Cadmium Plate

Q.—I am writing you today in reference to cadmium bright plating which can be used on jewelry.

We have tried several kinds but they don't seem to stand up for any definite period, even with the replenishing every few days.

I judge that you are familiar with this new plating.

At the present time I have tried out a new one, but it comes up very cloudy and ruins the finish on our work.

A.—Cadmium plating cannot be used to plate jewelry in imitation of platinum. Chromium plating, successfully handled, can be done to give an excellent high finish.—J. H.

Racking Hardware

How to Hang a Number of Different Types for Plating

Written for The Metal Industry by WILLIAM E. BELKE, President Belke Manufacturing Company

Rubber covering of racks has especially engrossed many platers. I received several bare metal racks recently, which were five times their original weight, due to metal being encrusted on the spine. I figured out that these racks required ten times the amount of current that they needed before the metal had been placed on the spine. Originally, the rack, with the tips, had weighed four pounds. I figured out that 1½ cents were wasted every time these racks were immersed. This 1½ cents included the amount of metal which was diverted from the product to the spine (the product was small, and the rack actually attracted seven times as much metal as all of the products placed on each individual rack), and included the addition of electrical energy required to plate the rack in addition to the products, considering its great surface. At this rate, 15 cents were wasted for every ten racks immersed, and, if one hundred racks were immersed ten times a day, the cost would be 150 dollars.

This rack, was, of course, coated with metal to the point of absurdity, and could not have lasted more than a few more immersions. Also, the firm was not large, and did not immerse one hundred racks ten times a day. But such firms as Western Electric, Gillette Safety Razor and Bridgeport Brass do have such a quantity of immersions.

I have chosen hardware parts for this article, and, although I have not been able to list all of the hardware products, which, for their number, would lead me into a maze of confusing detail, I am illustrating and explaining a few of the more important tools and manufactured parts.

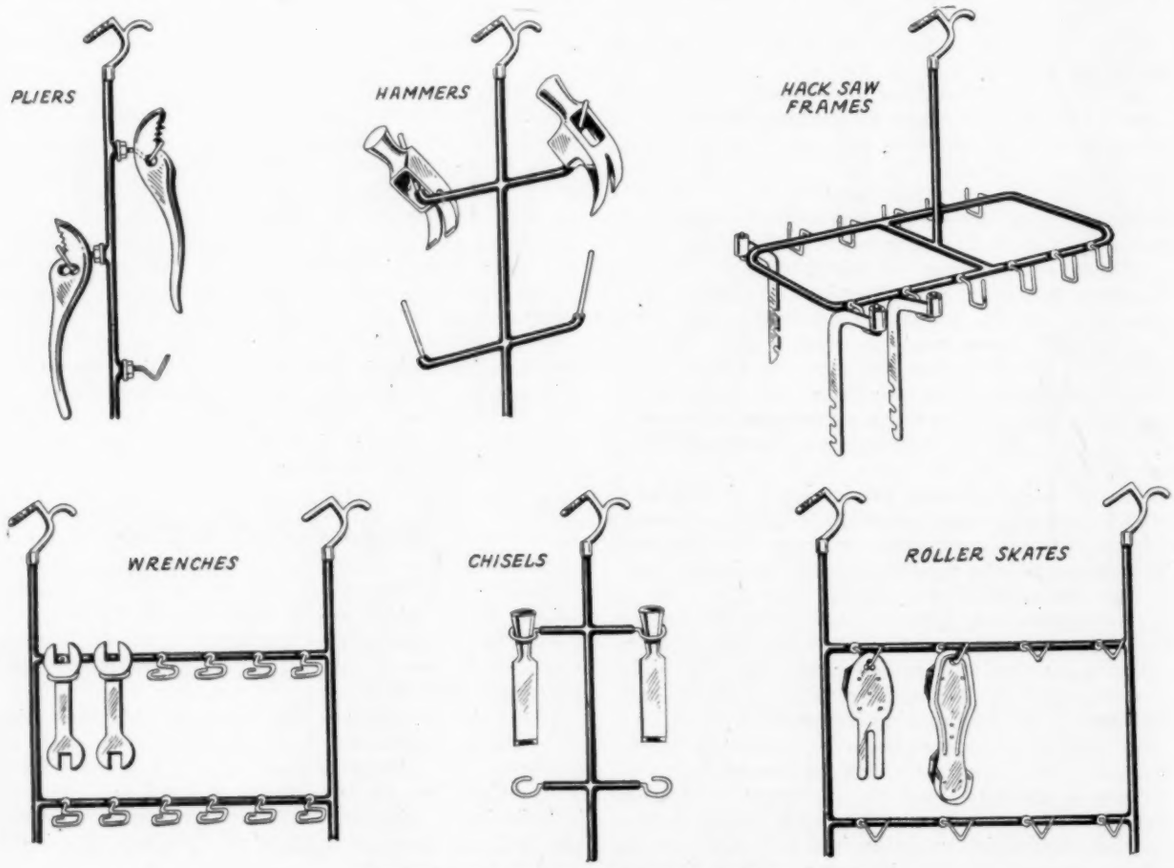
Illustration No. 1 will show the halves of pliers being racked. It will be noted that the tip, which is bent at the conventional angle to permit the half of the pliers to be hung by the lever hole, is slightly slanted, horizontally, to permit the part to hang straight up and down.

An ordinary tip, extending vertically, with a bend to support the plier half, would cause one side to face the anode, and the other side to face the rack. This would be partial to the side facing the anode. By the illustrated method both sides are equally distant and equally exposed to the anode.

The hammer head, in illustration No. 2 is simple, except that a rather heavy rack must be used to support the weight of several heads. The arms extend through the spine, and reach far enough out to support and balance the hammer head adequately.

Illustration No. 3 shows the special manner recommended for the peculiar shape of hack-saw frames. The tip terminates in a vertical position, allowing the small hole of the frame to slip over the tip. The frame is then swung inward, towards the rack, to support it well and to prevent it from swinging to and fro in the solution.

Wrenches are racked by slipping through a two-thirds circle tip, which catches the wrench under its head. The fact that the tip touches the surface of the wrench need not matter, for plate will form very well between the tip



METHOD OF HANGING HARDWARE FOR PLATING

and the wrench, due to the loose position of the tip.

Chisels are racked very much as the wrenches, only the rack is of a different shape, due to the greater length of the chisels, and the fact that they are plated with greater care. For this reason a rack is recommended which will not hold more than six. The illustration of the roller skate rack is self-explanatory.

Whenever figuring on a new product, one should consider a great many angles. First of all, where shall the tip hold the product? Perhaps the product has a hole, and the tip can extend through it; perhaps the product has no hole, but has a part which is not to be plated, and will provide a handy place to support it.

Then consider the type of rack which shall be used. Shall it be a single spine rack, with horizontal arms? Or a compound rack with arms extending from the two sides? Or a basket type rack, which is a horizontal framework, support from the center by the spine? The size of the product, the tendency to swing, the weight, the part which should be best plated—all of these features enter into consideration.

Then, of course, it must be made practical. Figure out whether the rack can be made in quantities cheaply. If one can use a large number of stamped or sawed rods, then one can make and assemble the rack easily and at little cost. Again, consider, will the rack be easily rubber coated? In making a rack all of this must be kept in mind, for cost of the rack is vital to economy in the plating plant.

I remember how carefully one company designed several thousand racks, at great cost, only to find that the lowest products were nearly always spoiled. It was found that the lowest products extended farther down than the bottom of the rack, and when employes set the racks on the floor, while working, the lowest piece touched the floor.

And, again, racks have been made so that plating is quite successful until they put the racks on a rod agitator. Then, because the tips allow too much swinging, the agitator gently and effectively causes half of the articles to fall to the bottom of the tank.

Necessity, it is said, is the mother of invention. However, I can think of no better tutor to guide the invention along to ultimate perfection than experience.

Burnishing Gold

Q.—We inclose prints of a saxophone and wonder if you can give us some help on a little burnishing problem we are encountering?

Note 1 on the saxophone bell. The diameter of these bells is 4½ in. to 8 in. and they burnish perfectly with hand burnishing tools. They are gold lined. Now note No. 2. This bell runs from 26 in. to 28 in. Bells are plated exactly the same as the small bells. They burnish perfectly to within about six inches of the outer edge. The gold on the outer edge seems to be very tough, making it practically impossible to burnish.

A.—Without question your trouble is in your plating and not with your burnishing methods. It is impossible to identify the cause of your trouble without actually viewing the conditions under which you are operating. However, we suggest that you notice the relative distance between the anodes and the horns that burnish up satisfactorily; the distance between the anodes and the horns that do not. To us it looks as though the larger horns have a burnt deposit, due to being too close to the anodes at too high a current density. —J. H.

Soldering Cast Iron

Q.—Can you give us any information about soft soldering cast iron?

A.—Cast iron is supposed to be difficult to solder but the work can be successfully accomplished in either of the following ways:

Clean the joints thoroughly, then scratch brush with a brass brush until the surfaces to be joined are covered with a coating of brass rubbed from the brush. Then tin and solder in the usual way.

The other method is to take a small quantity of mercury and amalgamate with it tin filings until it forms a plastic amalgam. Clean the surfaces to be soldered. Take a rag dampened with muriatic acid and rub a little of the amalgam on it. Rub this amalgam thoroughly into the metal at the joint then solder in the usual way.

Often undiluted zinc chloride will answer. Many times the trouble in making solder stick to cast iron is not in the flux but in the fact that the casting is too large to heat readily as the surface to be soldered or tinned must be heated considerably to make the solder flow.—P. W. B.

Taps for Brass

Q.—As we are making our taps for use on brass and iron from high speed steel in place of carbon tool steel and this saves us from carrying two taps, one for brass goods and another for iron. Is there a good way to prevent high speed taps from scaling or threads becoming rough?

A.—Some use compounds of various kinds for this purpose. A mixture of 50 per cent corn meal, 20 per cent borax, 20 per cent common salt and ten per cent crushed resin is said to give good results. When the tap gets to a dull red in the preheating process it is dipped in this compound and then put back in the channel iron for further heating. This forms a coating which protects the threads and is easily washed off. At the same time it does not prevent the sudden cooling of the tap which is necessary to secure the desired hardness.—P. W. B.

Cleaning Composition Metal

Q.—How can I clean and nickel plate a bronze casting (85-5-5-5)? I cleaned a piece in some metal cleaner, and when nickel plated, the article appeared to have a dull finish in spots which would strip when buffed. Pieces of brass cleaned and plated at the same time came out of the solution bright.

A.—There is no reason why bronze casting of a composition 85-5-5-5 should not plate. Use a mild cleaner alkaline, and after rinsing, dip in a 5% solution of sulphuric acid before placing in nickel tank.—J. H.

Cadmium Salts in Nickel Plating

An investigation was made at the University of Maine by Professor H. C. White and K. L. Proctor to determine the effect of cadmium salts in still nickel plating solutions, using standard plating solutions and the commercial current densities. The percentage of cadmium chloride in the bath was increased in each run by 0.01 per cent and the deposit became increasingly brighter as the percentage of cadmium salt was increased, up to 0.05 per cent. From this point to 0.10 per cent there seemed to be no change. Above 0.10 per cent the deposits became poorer in quality. With 0.50 per cent the deposit was bad, black in color. The proper range obtain the maximum brightness was between 0.05 and 0.10 per cent cadmium chloride.

Organization of the Hanson-Van Winkle-Munning Company

The Hanson-Van Winkle - Munning Company was organized under the laws of New Jersey and began operation as of September 1, 1927. The new company has purchased assets of the Hanson & Van Winkle Company of Newark, N. J., and A. P. Munning & Company of Matawan, N. J. It will have its main office for the present at 339 Chestnut St., Newark, N. J. It will have the following factories:

A. P. MUNNING
Chairman of the Board

VAN WINKLE TODD
President

(1) A. P. Munning & Company factories at Matawan, N. J.
(2) The Hanson & Van Winkle Company factories at Newark, N. J.
(3) A. P. Munning & Company factory and warehouses at Chicago, Ill.
(4) The Hanson & Van Winkle Company factory and warehouses, Chicago.

The officers of the new company are as follows:

Chairman of the Board	A. P. Munning
President	Van Winkle Todd
Vice-President	F. L. Hewitt
Vice-President	F. T. Taylor
Vice-President	H. L. Zucker
Treasurer	P. P. Munning
Secretary	E. N. Boice

In addition to the above, all of whom are Directors, we will have as further Directors—Julian A. Gregory, Guerin Todd and Waldron A. Ward.

The organization of the new company, until further notice, will operate under the divisional form and for the present the operative personnel will be as follows:

The President will be in charge of the general conduct of the company's business and be responsible therefore to the Chairman of the Board and the Board of Directors.

F. L. Hewitt, Vice-President, will be directly attached to the staff of the Chairman of the Board of Directors and be responsible to him and work with him.

H. L. Zucker will be attached directly to the President's staff and work with him in general charge of manufacturing operations.

F. T. Taylor will be a staff officer directly attached to the President and will have entire charge of engineering, research and development, and be responsible for all new developments. He will be consultant to anyone and act in every way to further the interests of the company.

P. P. Munning will be in entire charge of the company's finances.

E. N. Boice will be Secretary of the company.

All of the above personnel will be located at either one of the main offices of the company, namely 339 Chestnut St., Newark, N. J., or the plant at Matawan, N. J. It is understood that for legal purposes, 339 Chestnut St., Newark, N. J., is the official legal headquarters of the company, but that the company will also maintain headquarters at Matawan, N. J.

Sales offices will continue as follows:

(1) Eastern Territory—F. J. Clark, 43 Ft. Pleasant Ave., Springfield, Mass.; F. J. Knecht, 50 Hubinger street, New Haven, Conn.

(2) New York Office—C. G. Backus, 52 Vesey St., New York; A. R. Todd, Newark, N. J.; F. S. Bruen, in charge of New Jersey territory, 52 Vesey St., N. Y.; Wilson Pollard, Newark, N. J.

(3) Philadelphia Office—J. A. Munning, P. W. Eckfeldt, J. T. Homan, 447 The Bourse.

(4) New York State Territory—J. W. Pearsall, 152 Furman St., Schenectady; H. A. Todd, Syracuse; J. J. Knodel, Syracuse.

(5) Cleveland Office—R. McCahan, 1434 W. 3rd St.; F. G. Cyrex, Euclid-61st St. Building.

Detroit Office—M. Cherry, 5415-12th St.; M. J. Moll, T. F. Bergin, 1923 Division St.

Chicago Office—Harry C. Stewart, G. A. Spencer, 842 W. Erie St.; E. Lamoureaux, 2920 Carroll Ave.

In addition to the sales offices mentioned above which cover the various districts as heretofore outlined by each company, the business will be handled in the St. Louis territory by the G. S. Robins Company, and on the Pacific Coast by L. H. Butcher & Company with warehouses and offices at Los Angeles, San Francisco and Portland, Ore., and J. C. Miller & Company with warehouses and offices at Grand Rapids, Mich.; Frost-Kraus Company of Minneapolis will remain distributors in that section of the country, working with the Chicago office.

For the present, the Sales Department will operate under Warren C. Carey and W. L. Neu, A. P. Munning expects to give his attention, in addition to his other duties, largely to the direction of the Sales Department. Similarly, Van Winkle Todd, in addition to his other duties as President of the company, will give direction to the manufacturing department, working in conjunction with H. L. Zucker and others.

There will be two assistant treasurers, one stationed at Newark, N. J., and one stationed at Matawan, N. J., attached to P. P. Munning's staff. There will also be an assistant secretary attached to E. N. Boice.

The policy of this company will be as follows:

(1) To tell exact facts when such are available, and when matters of opinion are only available, to give opinions based on engineering data and knowledge.

(2) To manufacture and sell only the very highest grades of material in this line.

(3) To have a one price standard.

(4) To cultivate and make friends of customers in every way possible by courteous attention to requirements.

(5) To help develop the industry and art by constant endeavor to better the things they are doing.

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With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER
THE ELECTRO-PLATERS' REVIEW

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EDITORIAL

NATIONAL PROBLEMS

The Mining Congress Journal sent out a number of questionnaires in the Fall of 1926 on the subject of some outstanding national problems. These questionnaires were sent to national associations, men and women in public life, editors, economists, professional men, wholesalers, transportation heads, bankers, producers of raw materials and manufacturers. Among the questions are those given in brief below. They will interest every public spirited individual.

1. What is wrong with the Federal income tax system and how may it be simplified?

2. What would you suggest to slow down the issuance of tax free securities?

3. Do you believe that efficiency would be maintained and production costs lowered by the adoption of the 5-day week?

4. Do you favor voluntary consolidation, compulsory consolidation or the present individual freedom of action of railroads?

The consensus of opinion of the majority who answered these questions was in a general way as follows:

1. Simplify the returns so that a man of average intelligence can accurately make his return without assistance. Employ more competent men in the Internal Revenue Department.

2. Prohibit tax exempt securities and pass legislation to that effect. Educate the people in the basic principles of economics, taxes and government.

3. Sixty-six per cent of the total replies were opposed to the 5-day week in any form for any phase of industry. Nineteen per cent were in favor of its adoption as an American standard.

4. Voluntary consolidation was favored by 73 per cent of the total replies.

The results of this survey are enlightening as a cross section of the opinion of the business and professional groups in the United States. The topics covered some of the most important economic and social problems before us today and the opinions expressed seem to point out clearly that these groups, while they feel the need of change in some respects, have, on the whole, a strong objection to any radical change in the present industrial structure.

This is perfectly understandable. The groups to whom the questions were sent are of the more careful and conservative types. Moreover conditions in the past few years have been such as to discourage efforts to change. The nation has been prosperous and the natural tendency is to resist any sharp reversals which might endanger this prosperity. On the other hand the answers were thoughtful and did not merely recommend leaving well enough alone. They are a clear indicator of the strength of our present government and the approval which it has elicited from the majority of the voters.

THE PROFITS OF RESEARCH

There are two kinds of research, pure and applied. Pure research is work carried on to discover basic principles and facts. Applied research has for its object the development of methods and equipment to be put, as fast as possible, to profit-making use.

Basically, both these types of research have the same object, the improvement of the conditions of humanity, but pure research takes as its main and immediate field only the extension of knowledge while applied research picks up this knowledge and puts it to practical use.

To discuss the relative values of these two types of work is useless. Both are indispensable. Improvements in industry are impossible without basic facts and principles to work with, and the relation between the pure scientist and the technician is always that of the co-worker—never the rival.

The National Academy of Science recently published an appeal to a body of prominent men to join with the leading scientists of the country in an endeavor to secure larger resources for research in pure science. An annual income of at least $2,000,000 is desired to bring the United States to its proper place in pure science research. We are leading all nations in industrial research but are far behind in pure science. Secretary Hoover has accepted the chairmanship of the Board of Directors for these funds.

A recent address by W. M. Corse, who is well known to our readers, on the subject of Traffic Signals in Industry, before the Textile Institute Club, points out clearly the practical benefits to be gained by research. He points to the Mellon Institute, The Bell Telephone Laboratories, The General Electric Company, Eastman Kodak Company, Victor Talking Machine Company, The International Nickel Company, The Union Carbon and Carbide Laboratories, The Duriron Company, and a number of co-operative organizations in the fields of canning, packing, tanning, steel founding and aluminum bronze. The budgets of these organizations total millions of dollars annually and the fact that this money is well spent is proved by such outstanding achievements as the modern incandescent lamp, photography, radio, improved talking machines, alloy steels, non-ferrous alloys, the widespread use of nickel, and the giant strides of aluminum.

Examples can be added indefinitely in industry, medicine (of which Rockefeller Institute is the best known example) and other fields. What is the answer? Simply that those organizations financially able should press research with all possible vigor in their specialized fields. Organizations which are too small to support such work should join the co-operative work in their industries. The government, through the Bureau of Standards, is doing outstanding work in a number of directions. The National Research Council, Smithsonian Institution, the National Academy of Science and others should be en-

couraged and aided in their efforts. No one is too strong to need research and few are too weak not to be able to help in one way or another. The results will be immensely worth while for individuals and for the nation as a whole.

ELECTRO-PLATING SUPPLY MERGER

In this issue on page 382 is the announcement of the merger of the Hanson and Van Winkle Company of Newark and A. P. Munning and Company of Matawan, N. J. This merger is of outstanding importance because it unites the two largest companies in the field of electro-plating equipment and supplies.

Complete histories of these two companies were published in our issue of June, 1926. The Hanson and Van Winkle Company was established in 1820 and is now 107 years old. It is known internationally whereever electro-plating is done. It has remained since its organization, in the hands of the descendants of the founders. A. P. Munning and Company were founded in 1911 and have grown with extraordinary rapidity. Mr. A. P. Munning, president, was for a number of years sales manager of the Cutler-Hammer Manufacturing Company, and before that time was with the General Electric Company. He was therefore, able to apply, in the electro-plating field, the principles which were successful in the companies with which he gained his experience.

In announcing the formation of the corporation, Mr. Munning, Chairman of its Board, stated that one of the main objects for its formation was the following:

"Further progress in the polishing, plating and finishing of metal surfaces can best be achieved through industrial leadership, affording increased facilities for research, for engineering development, for manufacturing and distribution. To do this on a comprehensive scale, requires a very large capital and trained technical staff. The bringing together, therefore, of these two old and long established companies means more than a pooling of assets. It means that the knowledge, the records and the experiences gathered by each of the two companies over a long period of years will be made available to materially strengthen the research and engineering facilities, for their customers and the public in general. It also means that with the best facilities at their command, the products for developing new and better equipment and supplies and rendering a practical service in connection with their use is considerably increased. It certainly means, also, that lower manufacturing costs will ultimately tend to lower the prices of those commodities which can be manufactured in volume, thus again benefiting the customers of the combined organization."

The electro-plating supply industry, it seems, has adopted the methods of other industries, namely the development of one great factor by combination, to operate with the competition of a number of smaller organizations. In other lines, such as steel and copper, this has been proved highly successful. Whether this principle will be applicable to an industry smaller than steel or copper production, and of course, different in character, remains to be seen. It would appear, however, to be a logical step towards stabilization.

STANDARD CRUCIBLES

A few months ago the American Foundrymen's Association sent out a questionnaire to users of crucibles in metal foundries, asking how generally the recently issued tentative standards were being used in the industry. The Foundrymen's Association is working on this project with the American Engineering Standards Committee in order to regularize the crucibles used in foundries, presumably as one step in the standardization as far as possible, of all foundry equipment.

This project needs no praise as its worthiness is obvious. We urge our readers to answer the questions without delay and return them to the American Foundrymen's Association at 140 South Dearborn Street, Chicago, Ill. Those who have not received a copy should communicate at once with the Secretary at the above address. Copies of the Tentative Standards referred to by this questionnaire can be obtained from the American Engineering Standards Committee, 29 West 39th Street, New York, referring to Tentative Standard H 13-1925.

PLATERS' SOCIETY GROWTH

The recently published statistics of the American Electro-Platers' Society in the Secretary-Treasurer's report for the year ending May 31, 1927, are interesting and encouraging. The membership on June 1, 1926, was 1,124. On June 1st, 1927, the membership was 1,201, a gain of 77 or about 7 per cent. The cash on hand rose from $1,142.62 in 1926, to $1,761.22 in 1927, a gain of $618.60, about 54 per cent.

Gains made by the individual branches are as follows:

	Members	Per Cent
Philadelphia	18	21
Chicago	17	9
Rochester	8	20
Detroit	6	9
New York	6	8
Providence	4	8
Toronto	4	7
Toledo	3	14
Dayton	3	11

The large item of expenditure is, naturally enough, publications, (The Monthly Review) which cost $1,340.33, about 48 per cent of the total.

This report indicates that the American Electro-Platers' Society is in a healthy condition, growing steadily and ably managed.

CHARLES H. PROCTOR HONORED

The New York Branch of the American Electro-Platers' Society at their meeting of June 24th, 1927, unanimously elected Charles H. Proctor, plating-chemical editor of THE METAL INDUSTRY, an honorary member of that branch. The election was in recognition of his long, persistent and indefatigable labors in behalf of the New York Branch in particular, and the American Electro-Platers' Society in general.

Mr. Proctor is generally known as the founder of the American Electro-Platers' Society, having been the original worker for its organization. He has seen it through its early years of difficulty and its present prosperity. He has been one of the most powerful forces in its growth and development.

The electro-plating industry owes a debt to the American Electro-Platers' Society and to Charles H. Proctor. He has left his imprint on the industry in such a way as few men have ever been able to do in any field of endeavor.

CORRESPONDENCE and DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein

SPOTTING OUT

To the Editor of THE METAL INDUSTRY:

We have read with interest the article entitled "Spotting Out" by A. Kenneth Graham in the July number. Mr. Graham makes an explanation for the mechanism of Spotting Out which he deems is not original but is "gleaned from opinions expressed in the literature, from practical platers, and experiences." He also mentions that his explanation would probably apply to spotting out on die castings.

It has been our experience that his explanation exactly applies to most cases of spotting out on die castings. The greatest proportion of die castings plated are made of a zinc base alloy which is even more susceptible to the action of either acids or alkalis than the brasses and coppers which Mr. Graham refers to.

In addition to this fact, die castings have a peculiar structure which lends itself, when they are improperly handled, to the presentation of a porous surface to the cleaning or plating solution.

The outer layer of metal in a die casting is very dense since it is the first to chill. After this is removed in a polishing operation, the metal becomes more and more porous or spongy as we get closer and closer to the center. The center of the casting is practically always spongy because of the fact that it is the last area to freeze and the lower melting point constituents are drawn from the center of the casting by shrinkage. Consequently, if a die casting is polished too deep or if too much of the hard dense metal is removed, it will present a porous surface. This porous surface will absorb either cleaning or plating solution, and this solution will be retained under the plate. In a matter of a few hours or a few days, depending upon the strength of the solution, gases will be developed which cause the plate to blister.

The same phenomenon is observed when the surface of the casting is streaky or rough as the depressions hold the solution in the same manner.

The remedies for Spotting Out on the zinc die castings are about the same as Mr. Graham mentions in his conclusion, viz: the making of a smooth casting with the elimination of impurities and as short a time as possible in the cleaning solution. It is also advisable to use a high voltage on the initial plating in order to cover the casting with the plated metal before it has a chance to react with the plating solution.

These remarks are general and are offered simply in amplification of Mr. Graham's article. They are acquired, as are his, from current literature and experience.

We believe that they will be of interest to readers of his article.

Yours very truly,
THE STEWART DIE CASTING CORP.
D. L. COLWELL,
Metallurgist.

Chicago, Ill., August 1, 1927.

ALUMINUM LUBRICANT

TO THE EDITOR OF THE METAL INDUSTRY:

I notice, on page 330, that you are advising as a lubricant for aluminum, to use gasoline.

I would suggest that instead of using gasoline, they would use fish oil. This is not expensive, and is very good for lubrication and, furthermore, will not tarnish the aluminum.

ANDREW V. RE.

Coldwater, Mich., August 13, 1927.

NEW BOOKS

History of the Incandescent Lamp. By J. W. Howell and Henry Schroeder. Published by the Maqua Company, Schenectady, N. Y. Size 5¼ x 7½, 208 pages.

This book published under the auspices of the Edison Lamp Works of the General Electric Company, Harrison, N. J., describes in a simple and interesting manner the development of the incandescent lamp prior to Edison's invention up to the present time. As this lamp is the foundation stone upon which the great electric light and power industry of today has been built, the book has significance for every industrial user of electricity. The rapid advancement made by lamp manufacturer within recent years, in the development of filaments and the improvements in their manufacturing processes has been such as to make this industry one of the most important.

The book will be sent with the compliments of the authors to anyone interested.

Industrial Research Laboratories of the United States, Including Consulting Research Laboratories. Third edition revised and enlarged, compiled by Clarence J. West and Ervye L. Risher for the Research Information Service of the National Research Council, Washington, D. C.

The demand for this bulletin has been so large as to necessitate a third edition. The original publication was compiled in 1920 and listed about 300 industrial laboratories. The present revision contains data for 1000 laboratories. An interesting feature of this compilation is the fact that the names of the directors of the laboratories are given, making it a very complete directory.

COPPER PROTECTS EUROPEAN LANDMARKS

How Europe protects its famous landmarks against the effects of bad weather is described in a special bulletin just issued by the Copper and Brass Research Association.

The bulletin shows that for centuries European countries have honored their distinguished dead by making their last resting places secure against the ravages of time and the elements. Erasmus, the celebrated Dutch scholar and theologian of the Middle Ages, lies under a rustproof copper roof in the Swiss Cathedral of Basel. Since 1791 France has buried her great men in the Pantheon at Paris. Except for slight alterations when the scheme of architecture was changed, the copper dome of the Pantheon has remained untouched since its original construction. Also, in Paris is the stately Invalides, where Napoleon Bonaparte lies under a magnificent copper-covered dome.

Although few copper roofs in Germany were left undisturbed during the recent war when all available copper was needed for munitions, the Kaiser spared the red metal on the great domes of two historic Berlin churches. One of these surmounts the cathedral on the Spree, known as the Dom, and rises to a height of 380 feet. The other spans the 18th century St. Hedwig's Church. Constant exposure to rain and snow was wearing away Berlin's historic Brandenburg Gate, 133 years old, when the city recently installed copper flashings and gutters on this sandstone monument.

GOVERNMENT PUBLICATIONS

Comparison of American, British, and German Standards for Metal Fits, by Irvin H. Fullmer. Technologic Paper of the Bureau of Standards, No. 344, obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C. Price 10 cents.

Stoves, Ranges, Domestic Heating Apparatus, and Steam Fittings. Census of Manufactures for 1925. Obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C. Price 5 cents.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. PETTIS, Rolling Mill; W. J. REARDON, Foundry; W. L. ABATE, Brass Finishing; CHARLES H. PROCTOR, Plating Chemical; P. W. BLAIR, Mechanical

BRIGHT NICKEL

Q.—Enclosed you will find samples of screw-drivers which our customer is complaining about the steel part not being bright enough. We are sending you three samples: one as we receive it; one burnished with 5/32″ steel balls, soap and water; the other one burnished, nickel plated and dried out in sawdust.

What we would like to know, is how can we get the steel part a good bright finish without putting them through the burnishing balls again after nickeling.

A.—The solution of your problem in our opinion would be to nickel plate the small screw-drivers in a bright nickel solution following the preliminary ball burnishing to obtain the desired lustre on the article. You do not mention the formula you are using for nickel solution at present. The solution should approximate the following: Water, 1 gallon; single nickel salts, 16 ozs.; sal-ammoniac, 2 ozs.; boracic acid, 1 oz.; Epsom salts, 12 ozs.; cadmium chloride, 1/64-oz. The last material mentioned is the brightening agent and must be added at intervals when the nickel deposit is no longer of a bright lustre.

Without knowing the composition of your nickel solution, we suggest that you add ⅛-oz. muriatic acid per gallon of solution and to each 100 gallons of solution ½-oz. cadmium chloride, first dissolved in water at 200 deg. F. Place in the solution as cadmium anodes to maintain the bright lustre nickel deposit 2 cadmium sticks, 9″ long, ⅜″ in diameter; when the nickel solution is not in operation for an hour or two remove them or an excess of cadmium may result in solution that may darken the nickel deposit. We caution you to add only ½-oz. cadmium chloride per 100 gallons of solution, not per gallon. The addition of 1 oz. trisodium phosphate per gallon of ball burnishing solution will give you a better lustre on the steel.—C. H. P. Problem 3,674.

BRONZE PLATING

Q.—Under separate cover we are sending sample of bronze plating. From time to time we receive jobs calling for this finish but so far have been unable to match this color and would greatly appreciate it if you would help us out by furnishing the formula and method of procedure to obtain this finish.

A.—We suggest the following procedure to reproduce the bronze finish on brass as per sample submitted. The articles should be polished and buffed to a finish. Bronze plate in a solution prepared as follows: Water 1 gallon; sodium cyanide, 4½ ozs.; copper cyanide, 2¾ ozs.; zinc cyanide, ½ oz.; bisulphite of soda, 1 oz.; caustic potash, ½ oz.; hyposulphite of soda, 1/32 oz. Temperature of solution, normal; voltage 4 to 5; anodes 90% copper, 10% zinc.

Use one third of the water first at 160 deg. F., dissolve the materials in the order given, then add the balance of the water. After bronze plating, wash thoroughly and oxidize with a regular polysulphide solution. Water, 1 gallon; polysulphide ¼ oz.; ammonia, 26°, ⅛ oz.; temperature, 140 to 180 deg. F. After oxidizing, brush down with a soft scratch brush or Tampico wheel with pumice stone and water as the abrasive. Finally dry out and lacquer as usual. The lacquer should be very lightly tinted with a gold lacquer to bring up the yellowish bronze tone.—C. H. P. Problem 3,675.

CADMIUM AND ZINC SOLUTIONS

Q.—I have some trouble with cadmium plating iron and beg to ask for good formula for cadmium plating iron parts. I also want to get a formula for the zink-mercury plating used by some firms.

In the last issue of THE METAL INDUSTRY Mr. Proctor speaks of "Cyanobrite." What is it? Is it a cyanide salt or a mixture?

A.—The most successful cadmium plating solutions used in the United States are prepared as follows:

Water	1 gallon
Sodium cyanide, 96-98%	7 ozs.
Cadmium oxide	3 ozs.
Caustic potash	2 ozs.
Black molasses	1 oz.

Anodes, pure cadmium. Temperature, 100 to 110 deg. F. Voltage, 5 to 6. For zinc plating: Water 1 gallon; sodium cyanide, 96-98%, 4 ozs.; zinc cyanide, 4 ozs.; caustic potash, 4 ozs.; oxide of mercury, ⅛ oz.

Anodes, pure zinc. Oxide of mercury must be added to the solution at intervals to maintain a bright white color. Temperature 100 to 110 deg. F. Voltage 5 to 6.

If cast iron is to be plated in the zinc solution, then at least 1 oz. of cadmium oxide and 1 oz. more of sodium cyanide must be added to the zinc solution per gallon.

Cyanobrite is a mercury salt. It is patented in the United States. The use of mercury up to 2% or more in cadmium or zinc anodes is patented by the Roessler and Hasslacher Chemical Company, New York.

Steel is very successfully plated in zinc or cadmium solutions.—C. H. P. Problem 3,676.

CHROMIUM ON GRAY IRON

Q.—Kindly advise me any information that you may have on chromium plating, as to methods used. What we have in mind is the plating of gray iron castings, the castings will average about forty pounds.

A.—It is possible to chromium plate gray iron castings the weight you specify under conditions that must be specially developed for the purpose, which are as follows.

A complete electro-plating unit would have to be installed including steel plating tank, steel anodes, steam coils to heat solution and so connected that cold water could replace the steam, and a direct connected motor-generator set capable of developing sufficient current densities for the purpose, the voltage from 6 to 12; amperage based upon a minimum of 125 per sq. ft. of surface area; steel anodes to conform to the shape of the articles to be chromium plated, the distance from the articles to the steel anodes from 6 to 9 inches; volt and ammeter and rheostat control of the solutions so that a normal current density may be maintained at all times when known basically; methods to be arranged for cleansing the articles as would be used for other lines of plating nickel, etc. The solutions best adapted for the purpose would be as follows. Water, 1 gallon; chromic acid, 50 ozs.; chromate of iron, 2 ozs.; chromic sulphate, 1 oz.; or water, 1 gallon; chromic acid, 28 ozs.; chromic sulphate, 1 oz.; boracic acid, 1 oz.; chromate of iron, 1 oz. Temperature of solution 115 deg. F.; constant replacement of solution upon original basis in concentrated form.—C. H. P. Problem 3,677.

NATURAL BRONZE SOLUTION

Q.—What is a good natural bronze plating solution?

A.—Alloys of natural bronze vary in composition from 88% copper down to 75% copper depending upon the color desired. As foundry alloys, copper, zinc, tin and lead are used in bronze compositions but in plating natural bronze only two factors become effective, copper and zinc. Some firms prepare bronze solutions by electrolysis, that is the solution is prepared as follows: water 1 gallon; sodium cyanide 6 ozs.; caustic potash ½ oz.; bisulphite of soda 1 oz. Bronze anodes must be used, consisting of 85% copper; 15% zinc, or 90% copper, 10% zinc. The solution should be set up as for plating with as many anodes as possible. They should be carefully weighed first so that the amount of metal reduced in solution can be noted. Operate the solution at

4 to 5 volts and a good amperage. The cathodes to take the place of work should be of thin sheet steel. They must be clean before putting into solution. Continue electrolysis until sufficient metal has been reduced from the bronze anodes to give a good uniform deposit upon the sheet steel. You can then proceed with regular plating. At least 2 ozs. of metal will be required per gallon of solution. To prepare a bronze solution in regular manner, proceed as follows: Water 1 gallon; sodium cyanide 5 ozs.; copper cyanide 3 ozs.; zinc cyanide ½ oz.; bisulphide of soda 1 oz.; caustic potash ½ oz.; hyposulphite of soda 5 grains.

To prepare the solution, dissolve the sodium cyanide in ⅓ the water at 160 deg. F., then add the copper cyanide, then add ⅓ or more cold water. Reserve 1 oz. sodium cyanide from the 5 ozs. and dissolve this in as little hot water as possible for solution, then add the zinc cyanide and caustic potash and hyposulphite of soda. The point is to produce a very concentrated solution before adding to the copper solution previously prepared as outlined. The solution should be thoroughly mixed. Use anodes of same composition as previously mentioned. It is advisable to electrolyze the solution for a time with sheet steel as cathode. In operating the solution, always keep the tank replenished with clean water. All that will be required as chemical addition will be from ⅛ to ¼ oz. sodium cyanide and 1/32 oz. bisulphite of soda per gallon at intervals to maintain anode reduction. Always remove the anodes when the bronze solution is not in operation.—C. H. P. Problem 3,678.

NICKEL ON CHROME STEEL

Q.—I have to nickel plate several thousand pieces of chrome nickel steel, highly polished and glass hard. After buffing they are to be ground on one edge. The pieces are from 8 to 12 inches in length and 1 inch wide x 3/16 inch thick. I plated some recently but I flashed them in a cyanide copper solution first. This lot has to be plated directly upon the steel. My nickel solution is composed of single nickel salts 24 ozs. sal-ammoniac 4 ozs.; boric acid 3 ozs.; to each gallon of water. Temperature, 110 deg. F., voltage 3½ across tank; amperage 15 per sq. ft. I use a 25% muriatic dip, time of immersion, 10 seconds. Some of the pieces peel a little after grinding on the lower edges, but not many. Will you please tell me of any improved method of plating chrome steel with nickel direct; the kind of acid dip also time of immersion? I use comparators metal contest and acidity control. I keep my solutions up to a pH of 5.7-5.8.

A.—It might be worth while to look over an article published in THE METAL INDUSTRY, November, 1922, page 451, entitled Deposition of Metals upon Stainless Steel, by Joseph Haas. We should think that your problem is due to an oxide that is not reducible by ordinary methods of cleansing and acid treatment. You might try the following methods. Polish and alkaline cleanse as usual. Electro-acid cleanse in a solution consisting of water 1 gallon; sulphuric acid 25 ozs. fluid measure; anodes sheet lead; voltage 4 to 6; temperature 120 deg. F., time of cleansing 1 to 2 minutes. You might also try an immersion acid dip consisting of water 1 gallon; nitric acid 2 gallons; sulphuric acid 1 gallon, or proportions thereof as may be desirable. After acid treatment as outlined, wash thoroughly in cold water and nickel plate direct. It is advisable to use acetic acid in your nickel solution as the acidifying agent when required in nickel plating chrome nickel steel. As a final precaution, measure the cleansed chrome nickel steel. Articles can be brushed down with a plastic cleaner consisting of hydrated lime 2 lbs.; flour silica or fine pumice stone 2 lbs.; water as required to prepare the plastic mass. Dissolve sodium cyanide in the water before mixing with the lime and silica in the proportion of 4 ozs. per quart of water. The cyanide will prevent any oxidation of the metal surface. Wash the articles in water as usual, then nickel plate direct.—C. H. P. Problem 3,679.

NICKEL ON STEEL KEYS

Q.—We have been plating, for the past several years, cash register keys for a firm in this city that manufactures cash registers. This firm subjects these keys, after they have been plated and buffed, to an individual test of each key which in our estimation is unfair. These keys are tested with a rounded or flat tool and rub metal against metal. If the nickel raises or peels the keys are rejected and returned to us to be refinished gratis. We feel that the above is not a fair test, as we do not know of any nickel that can be burnished with a steel tool and stand it. We would be more than pleased if you can enlighten us on this subject.

Their work is handled in the following way. We have a very efficient plater who has taken every precaution to prevent any cause for peeling or blistering. These keys are stamped from 3/16 polished cold rolled steel. Then they are polished for plating. Next they are tumbled in sawdust to facilitate the cleaning of the article. They are racked and run in an electric cleaner, then immersed in acid water and rinsed. They are then placed in nickel tank and run for an hour to an hour and a quarter. They are then rinsed and dried in hot water with whale oil soap in it. The keys are then color buffed on 14 inch sewed buffs.

We feel that our whole difficulty is in the way this firm tests these keys and not in our method or our solution.

A.—We certainly agree with you that your customer applies an extremely rigid test to the nickel plated steel cash register keys you finish for them, and as a rule other firms that might finish the product would not give them as satisfactory a product as you do. Still, there can be an improvement in the adherence of the nickel deposit under correct solution conditions that should enable the product to pass your customer's rigid test, without any perceptible raising or peeling of the nickel deposit whatever. We assume that the articles are correctly cleansed which result in a chemically clean surface. Have you tried flashing the articles first in a combination cleaning and copper plating solution, previous to nickel plating? Why not try the method?

The trouble of peeling may be due to hydrogen in the nickel deposit. We suggest that your treat your solution first upon a test basis of 10 or 20 gallons to overcome the hydrogen condition. For a 20-gallon test solution, dissolve 5 ozs. sodium perborate in 2 quarts hot water, 120 deg. F., when all dissolved, add muriatic acid to the sodium perborate solution until it is of the same acidity as the nickel solution by blue litums paper tests. We believe that if your problem is due to your nickel solution, the sodium perborate factor will overcome it.—C. H. P. Problem 3,680.

RUST PREVENTION

Q.—I would like to know what is the difference in the three rust proof electro-plating arts, and which one of the three processes is the most satisfactory. Where can we get the proper concern? What is the Udylite plating; also what is cadmium alloy plating and chromium plating? We are running a job polishing and plating shop but I am beginning to think I am a back number. I have been in the plating game 50 years but all these new processes are Greek to me, that is why I am writing to you to see if I can find someone who will try to set me right with the proper information, as it looks to me nickel plating has got to give way to one of the later formulæ.

A.—The most important metals used commercially for the protection of iron or steel from atmospheric corrosion or rust is zinc. This can be put on by the hot galvanizing process, or by electro-galvanizing. Next in line is the cadmium. A regular solution for cadmium plating consists of water 1 gallon; sodium cyanide 96-98% 7 ozs.; cadmium oxide 3 ozs.; caustic potash 2 ozs.; thick black New Orleans mollasses ½ to 1 oz. Temperature of solution, 110 F. Anodes cadmium and sheet steel. Surface area 70% cadmium, 30% sheet steel. Voltage, still solution 4 to 5 volts; barrel 7 to 8 volts.

The result in plating steel by the Udylite process is a deposit of cadmium. Many firms use also Cadaloy solutions and anodes. They claim a harder and more resisting deposit when cadmium and mercury are applied to steel or iron. You must decide for yourself what process to use.

Chromium, Crodon, Chromolite are all essentially chromium deposits. Chromium is more difficult to deposit than any of the commercial metals. You can however, deposit the metal without patent infringement, if you operate a strictly commercial solution. Chromium does not completely protect steel from rust. It does however, give a flint hard surface when deposited upon steel or a solid nickel plated deposit applied to brass, etc. The deposit remains bright indefinitely. See radiator shells of the Oldsmobile automobile for example.—C. H. P. Problem 3,681.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

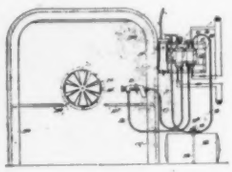
1,632,833. June 21, 1927. **Metal Pickling.** James H. Gravell, Elkins Park, Pa.

Means for confining the etching action of a metal to oxidized portions of metal surfaces which comprise a pickle regulator being an acid soluble water insoluble distillate from animal bodies.

1,632,909. June 21, 1927. **Buffing and Cleaning of Metal Parts.** Sumner Redway Mason, Wilmette, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y.

A buffing compound comprising an abrasive, a suitable binder of fat and wax, and a small percentage of a metal capable of free reaction with an alkaline solution to cause a generation of hydrogen gas to remove the compound from a buffed surface.

1,633,306. June 21, 1927. **Spraying Cabinet and Apparatus.** Howard G. Bartling, Chicago, Ill., assignor to Peerless Pneumatic System, Inc., Chicago, Ill.



A spraying cabinet having a frontal opening formed by an inverted U-shaped flange extending downwardly from the top of the cabinet and laterally inward from each side wall of the cabinet, the said top and the side walls being imperforate and adjoined to the said frontal portion; and a suction fan mounted substantially centrally in the rear of the cabinet and arranged for drawing air rearwardly through the cabinet.

1,633,523. June 21, 1927. **Polishing Wheel and Process for Treating Same.** William E. Foster, Detroit Mich.

In method of forming a polishing wheel from a plurality of superimposed sections consisting in infusing into each of said sections a mixture equally of oil and glue, pressing the surplus oil from each of said sections and gluing the faces of said sections together by affixing thereto an independent layer of glue.

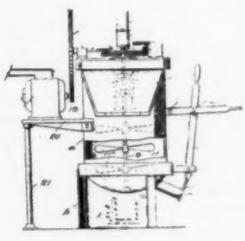
1,633,805. June 28, 1927. **Heat-Resisting Alloy.** Gerald R. Brophy, Schenectady, N. Y., assignor to General Electric Company, a Corporation of New York.

An alloy which resists oxidation at high temperatures having an iron base and containing about 10% of aluminum, 30% to 40% of nickel and 5% of chromium.

1,633,826. June 28, 1927. **Alloy.** William E. Ruder, Schenectady, N. Y., assignor to General Electric Company, a Corporation of New York.

A heat resisting alloy having an iron base and containing from 25 to 40% of nickel, from 7 to 9% of aluminum and from 7 to 15% of chromium.

1,634,217. June 28, 1927. **Dross Furnace.** George C. Schimpf, Baltimore, Md., assignor to Harry D. Harvey, Baltimore, Md.

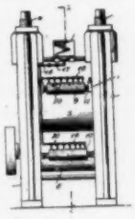


In a furnace for melting type metal dross, a melting pot having a hopper at one side, near the top, for the admission of dross, a cover extending over the furnace, a lid for said hopper, hinged to said cover, a shaft arranged vertically in the pot and extending through the cover, said shaft having blades at its lower end, a horizontally arranged shaft geared to said vertical shaft, bearings on the cover in which said horizontal shaft is mounted, and means for driving said latter shaft.

1,634,359. July 5, 1927. **Coating Composition.** Carl D. Hocker, East Orange, N. J., assignor to Western Electric Company, Inc., New York, N. Y.

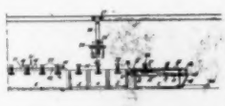
The process of producing a liquid coating composition which comprises heating tung oil with a smaller amount of glycerol, adding rosin oil thereto, and mixing therewith resin glyceride.

1,634,258. July 5, 1927. **Apparatus for Rolling Metal.** James F. Halpin, Derby, Conn., assignor to Seymour Manufacturing Company., Seymour, Conn.



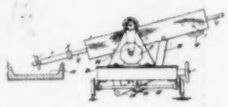
In a metal rolling apparatus, a pair of working rolls between which is passed metal to be rolled, a laminated lubricating roll in constant engagement with each of the working rolls, a lubricant reservoir, a main supply pipe leading therefrom, branch pipes connected to the main pipe and suspended above said lubricating rolls, and means for regulating the supply of lubricant from said reservoir to the lubricating rolls.

1,634,849. July 5, 1927. **Electroplating Machine.** Everton B. Powell, Newark, N. J., assignor to The Hanson & Van Winkle Company, Newark, N. J.



In an electroplating machine, the combination of a tank, a fixed longitudinal track mounted over the same, a truck on said track, an elevator on said truck, a cathode carrier adapted to be raised and lowered by said elevator and provided with a plurality of cathode hangers, and vertical guiding means on the carrier and at intervals along the tank for guiding the carrier as it is lowered by the elevator, whereby a plurality of articles may be placed simultaneously in the tank in definite positions in various locations.

1,635,037. July 5, 1927. **Means for Agitating and Stirring Molten Metal in Open-Hearth and Like Furnaces.** John Edwards, Swansea, England.

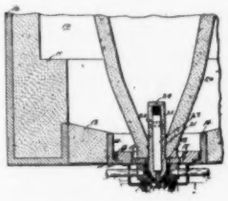


A device for agitating molten metal in an open hearth furnace comprising a shaft, agitating means carried by said shaft, means for rotating said shaft, means for tilting said shaft, and means for longitudinally advancing and retracting said shaft.

1,635,055. July 5, 1927. **Alloy Filament.** Aladar Pacz, Cleveland, Ohio, assignor to General Electric Company, a Corporation of New York.

A filament for incandescent lamps consisting of tungsten with less than 1% of zirconium.

1,635,653. July 12, 1927. **Method of Making Lead-Copper Particles.** Harry M. Williams, Dayton, Ohio, assignor to General Motors Research Corporation, a Corporation of Delaware.



1. A method of making composite metal particles comprising a mixture of metals which do not alloy or only partially alloy, which consist in mixing said metals in a molten condition, and atomizing the molten mixture while it is at a temperature higher than that at which the metals tend to segregate.

1,635,981. July 12, 1927. **Abrasive Article and Method of Manufacturing the Same.** Lowell Haines Milligan and Charles Herbert Quick, Worcester, Mass., assignors to Norton Company, Worcester, Mass.

The improvement in the manufacture of abrasive articles containing crystalline alumina and a vitrifiable bond mixture, which comprises firing the article to soften the bond mixture, and thereafter cooling the bond constituents to solidification under non-oxidizing conditions.

1,636,656. July 19, 1927. **Welding Copper and Aluminum.** James V. Capicotto, Brooklyn, N. Y., assignor to Dubilier Condenser Corporation, New York.

The method of uniting copper and aluminum, which consists in coating the copper with solder, bringing the aluminum in contact with the coated copper and then spot welding the parts of the two metals in contact with each other, to join them together.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

PRACTICAL ATOMIC HYDROGEN WELDING

Atomic hydrogen welding—the process by means of which hitherto unweldable metals can be melted and fused without the slightest trace of oxidation, and welding can be performed in some cases on metals as thin as the paper on which this is printed—is now made practicable by the use of equipment placed on the market by the General Electric Company. This process, making possible the welding of many special alloys and the production of ductile welds in iron and steel, is the result of research conducted by Dr. Irving Langmuir of the General Electric research laboratory. It was fully described in THE METAL INDUSTRY for May, 1926.

In brief, this method utilizes the passage of a stream of hydrogen through the arc between two electrodes. The heat of the arc breaks up the hydrogen molecules into atoms. These combine again a short distance beyond the arc into molecules of the gas, and in so doing liberate an enormous amount of heat, so that more effective welding temperatures can be obtained than with the usual welding methods.

FIG. 1. OPERATOR AT WORK

Since atomic hydrogen is a powerful reducing agent, it reduces any oxides which might otherwise form on the surface of the metal. Alloys containing chromium, aluminum, silicon or manganese can thus be welded without fluxes and without surface oxidation.

Thorough trials, extending over a period of many months, were made in the General Electric shops before introducing the new equipment. The apparatus, as finally designed, represents the result of continued experimentation and research.

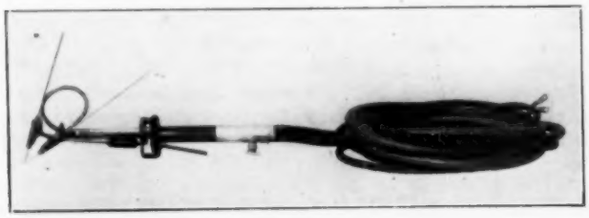


FIG. 2. ATOMIC HYDROGEN WELDING TORCH

The welding outfit consists of the following: (1) a single-phase transformer for converting the voltage of a 60-cycle source of power to one suitable for the welding equipment; (2) a specially designed, variable reactor to provide the proper welding current and voltage for different classes of work, and (3) the welding torch by means of which the actual work of welding is performed.

While the principle of operation is the same as that involved in the design announced by the General Electric research laboratory a year ago, the mechanical and electrical design has been much improved. The torch consists of a holder supporting two tungsten wire electrodes, the electric conductors connecting these electrodes to the reactor and the tubing for the hydrogen gas. Each electrode is supported inside a nozzle through which the hydrogen gas is forced out around the electrode.

The electric conductors to and through the torch are heavily insulated and, when welding ceases, the welding circuit is automatically interrupted until such time as the operator is ready to weld again, when the circuit is automatically restored. In contrast to the usual method of electric arc welding, there is no current flowing from the electrodes to the work to be welded. The circuit is completed from one electrode to the other.

FIG. 3. LOWER: THIN SAMPLE WELDED BY THIS METHOD, AND RAZOR BLADE.
UPPER: MICROPHOTOGRAPH OF EDGES OF BOTH, SHOWING THE RAZOR BLADE TO BE THICKER.

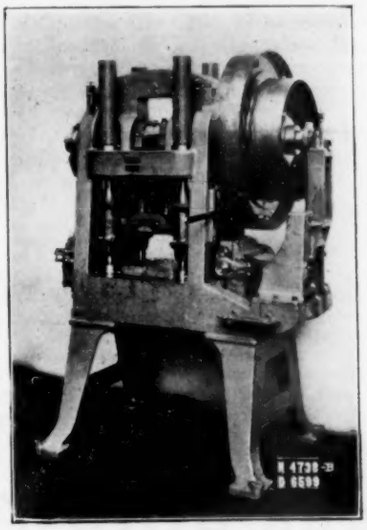
In making edge welds, the metal to be welded is melted under the heat of the arc but, when it is necessary to add additional metal, a filler rod must be used and fed into the arc in much the same manner as is followed in the ordinary gas welding process.

The new equipment is so far being marketed for operation from 60-cycle, single-phase circuits only, and is recommended for use on ordinary metals of less than ¼ inch in thickness, or on hitherto unweldable metals of greater thickness. Metals having a thickness of but 10 mils can easily be welded and little doubt is expressed that, in some cases, work as thin as 2 mils (about the thickness of ordinary writing paper) can be welded.

Because of the absence of oxides and nitrides from the weld made by this process, it is particularly adaptable to the welding of special alloys so far not weldable by other methods, and also makes a strong, smooth and ductile weld on ordinary iron and steel work. Inasmuch as pure chromium, nickel, copper, aluminum, silver and other metals and their alloys—not to mention iron and the more common metals—can be melted without oxidation, it is expected that new possibilities will be opened in such welding, although the field of application has been but partly studied.

FOUR-POST BLANKING PRESSES

Every manufacturer who uses power presses appreciates the advantages of accurately guided tools, especially for blanking and follow tool work. The new four-post high-speed blanking press recently brought out by the Waterbury Farrel Foundry & Machine Company, of Waterbury, Connecticut, has taken care of this accuracy in a new way; the machine also incorporates many novel features which make for high production and ease of operation. It is equally adaptable for blanking from the strip or for cutting or forming with follow tools. Illustration shows the front view.

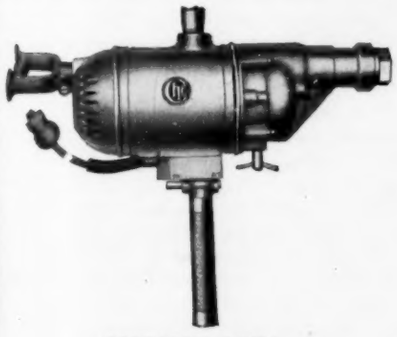


WATERBURY FARREL FOUR-POST BLANKING PRESS

The features claimed include the following: (1) practically perfect gate guide alignment with bearings above and below the tools; (2) shock-absorbing flywheel of assembled construction which is entirely new and makes possible unprecedented speeds; (3) patented friction mechanism that exerts no friction except when stopping the press, which can be accomplished quickly from high speed; (4) tools and work in full view from all sides and readily accessible; (5) double gate connections which are solid and simultaneously adjusted eliminating the possibility of strain on threaded parts; (6) lifter springs on each guide post which take up all backlash in the connection bearings; (7) any design of knock-out can be applied; (8) double friction roll feeds which eliminate the trouble and time required for changing ratchets and which permit adjustments from zero to maximum by the smallest possible increments, as well as long feeds by reason of the rack and pinion drive; (9) hand and automatic roll releases, vertical roll adjustment, and spring shock relief in roll feed connection; and (10) strong and rigid frame which is designed to facilitate the application of special attachments or for changing from belt to individual geared motor drive.

NEW CINCINNATI DRILL

Following along the lines of its 7/8″ drill, Type UN, the Cincinnati Electrical Tool Company of Cincinnati, Ohio, has recently added to its line a 2-speed portable electric drill of the same capacity, known as Type UR.



PORTABLE DRILL

This tool operates at the normal speed for ⅞″ portable drills, namely, 380 R. P. M. Inasmuch as this speed, however, is far too slow for the efficient use of smaller size drills, higher speed gearing is also provided. Speeds may be quickly changed by the use of a shift lever, even though the motor may be running.

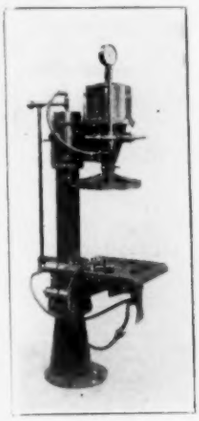
The Type UR drill is fitted with a No. 2 Morse taper socket in a removable sleeve. It is held in the drill spindle by a large hexagonal nut. Since the tang of the drill bit protrudes slightly beyond the end of the sleeve, the use of a drift in removing the drill is unnecessary.

Other features include the use of vanadium alloy steel gears and deep-grove radial ball bearings. A ball thrust bearing is provided to take up end thrust and adequate lubrication is secured through grease reservoirs. Heavy felt washers protected by metal retaining rings keep the motor windings clean and dry.

The use of square-type brush-holders allows for adjustment of brush spring tension and brushes are fitted with so-called "pig tails" or shunts. The patented "Cincinnati" fully-enclosed switch with cable clamp is standard on this tool. It can be furnished wound for 32, 110 or 220 volts.

THE TABOR POST SQUEEZER

The Tabor Manufacturing Company, Philadelphia, Pa., has designed the post squeezer as shown below. This machine has been developed and built with consideration for economic operation, speed and durability. It is also particularly saving in floor space.



TABOR POST SQUEEZER

The table of the machine, 16″ wide by 19″ deep, is capable of accommodating all flasks that would be considered for machines of this type. The squeezing cylinder is 10″ diameter and is located above the table of the machine. This cylinder is quickly swung into and away from the squeezing position by a handle conveniently located on the squeezing head. The same handle controls the squeezing operation by a slight downward pull on the part of the operator.

The Tabor post squeezer is furnished in both the plain squeeze and jar squeeze types. It can also be supplied either stationary or portable and an additional portable design with a wheel-base that will straddle a sand heap 19″ high and 60″ wide is also offered. The latter machine has proven extremely popular. Each machine is equipped with vibrator, pressure gauge and blow valve.

NEW AUTOMATIC STRIP BUFFING MACHINE

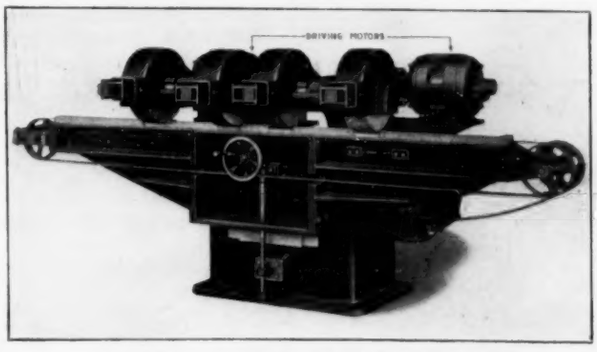
The Mitchell Engineering Company, of Springfield, Ohio, has brought out the automatic strip buffing machine illustrated, which is adapted to automatically buffing strips up to 3″ wide inclusive.

In operation it is only necessary to lay the strips on the conveyor belt at the left hand end of machine, which belt then carries the same past the wheels and discharges at the right hand end. The rate of feed is dependent on the nature of the work being buffed, any changes in which may be accomplished by simply changing sprockets on the conveyor drive.

The machine is provided with four buffing wheels, each two wheels driven by a 10 HP. motor, controlled by magnetic switches and operated by push buttons as shown. Each pair of wheels rotate in opposite directions, the method of buffing being for one pair of wheels to engage the strip or work from approximately the center to one outer edge, and the other pair of wheels from approximately the center to the other outer edge. This is said to give a much more desirable finish than if the wheels operated on the work longitudinally.

Means are provided for raising and lowering the conveyor table to keep the wheels in proper contact with the work.

Each pair of wheels with their respective driving motor is a separate unit, adjustably mounted on base of machine to permit of moving in or out, dependent on the width of strips.



AUTOMATIC STRIP BUFFING MACHINE

EQUIPMENT AND SUPPLY CATALOGS

Hardinge Conical Mill. Hardinge Company, York, Pa.

Tanks and Towers. W. E. Caldwell, Inc., Louisville, Ky.

Recording Ammeters. Bristol Company, Waterbury, Conn.

Unloading Muriatic Acid. The Duriron Company, Dayton, Ohio.

"It Pays to Try Samples." Frederic B. Stevens, Inc., Detroit, Mich.

Push Button Starting Switch. Allen-Bradley Company, Milwaukee, Wis.

Universal Blow Torch. Universal Torch and Manufacturing Company, Erie, Pa.

Collecting Fly-Ash and Coal Dust. American Blower Company, Detroit, Mich.

Copper Outlook and Investment Review. D. Houston & Company, Inc., 220 Broadway, New York.

Wooden Tanks for Every Purpose. Hauser-Stander Tank Company, Cincinnati, Ohio.

General Electric Publications. Sterling Rheostats, Remote-indicating Speed Controller; Electrically Heated Tempering Baths.

Year Book of the American Engineering Standards Committee for 1927. American Engineering Standards Committee, New York.

Bulletins and Price Sheets. Allen-Bradley Company, Milwaukee, Wis. These bulletins cover controlling of rheostats, starters, contactors, and switches.

The Duesenberg Racing Car. By T. H. Wickenden, Development & Research Department, International Nickel Company, Inc., New York. A description of the winning car in the 1927 Indianapolis 500 mile automobile classic and a consideration of the engineering features of its design, the selection of the materials used in its construction and the heat treatment to which the various parts were subjected.

Wright Whirlwind Engine. By T. H. Wickenden, Development & Research Department, International Nickel Company, Inc., New York. A brief history of the development of the Wright air-cooled motors with detailed information on the construction of the Wright Model J-5C Whirlwind Engine, its operating characteristics, the steels used in its construction, the heat treatment to which these are subjected and the physical properties developed.

Automatic Electric Melting Pots. Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. This publication, L-1868-B, covers the applications for which these pots are suitable and gives interesting operating data as well, listing the advantages secured by using this apparatus. The pots described have a maximum operating temperature of 950°F. and are largely used for melting soft metals, such as babbitts, and for low temperature drawing baths.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

INSTITUTE OF METALS DIVISION

HEADQUARTERS, 29 W. 39 STREET, NEW YORK.

The Institute of Metals Division will hold its meeting September 19-24, 1927, with the American Society for Steel Treating in Detroit, Michigan.

SESSIONS

The Institute of Metals Division will hold sessions for three days from September 20 to 22 inclusive at the Book-Cadillac Hotel. There will be one joint session of the Institute and A. S. S. T., Wednesday, 2 p. m., Hotel Statler.

Some of the sessions of the other three conventions being held at the same time, will undoubtedly be of interest to members of the Institute.

The American Welding Society, also meeting at the Book-Cadillac, will cover the latest developments and uses of welding equipment, and advances made in the welding industry.

The American Society for Steel Treating, at the Hotel Statler will include such subjects as the manufacture, use and treatment of iron and steel.

The Automotive Engineers, also holding its sessions at the Hotel Statler will take up methods of production in all departments of manufacture, including the use of machinery, machine tools, inspection and treatment of materials.

This is the first time the Institute of Metals Division is meeting with the American Society for Steel Treating and it is thought the arrangement will afford members of each the opportunity to enjoy broader facilities and will tend to promote co-operation among them in the public interest.

TECHNICAL PROGRAM

SYMPOSIUM ON NON-FERROUS COMMERCIAL ALLOYS

1. Commercial Forms and Applications of Aluminum and Aluminum Alloys, by P. V. Faragher.
2. Principles Covering the Heat Treatment of Aluminum, by H. H. Richardson.
3. Machining Aluminum, by R. L. Templin.
4. Some Aspects of the Commercial Manipulation of Aluminum, by C. F. Nagel, Jr.
5. Physical Characteristics of Commercial Copper-Zinc Alloys, by W. H. Bassett and C. H. Davis.
6. Nickel and Monel Metal, by C. A. Crawford.
7. Wrought Zinc, by C. S. Trewin.

OTHER PAPERS TO BE PRESENTED

8. Equilibrium Relations in Aluminum-Silicon and Aluminum Iron-Silicon Alloys of High Purity, by E. H. Dix, Jr., and A. C. Heath.
9. Heat Treatment of Aluminum-Silicon Alloys, by R. S. Archer, L. W. Kempf and D. B. Hobbs.
10. The Condition of the Thorium Content of Thoriated Tungsten Filaments, by Ancel St. John.
11. X-Ray Analysis of the Plastic Deformation of Zinc, by T. A. Wilson and Samuel L. Hoyt.
12. Quantitative Spectrum Analysis, by F. Twyman and D. M. Smith.
13. Production of Metallic Single Crystals, by J. A. M. Van Liempt.
14. Twinning in Ferrite, by L. W. McKeehan.

INSTITUTE OF METALS DINNER

Wednesday, September 21, at 7 p. m. at Book-Cadillac Hotel. Mr. E. Blough, technical director, Aluminum Company of America, will be the speaker. Mr. Blough will discuss the general technical aspects of the aluminum industry, referring to the recent developments in aluminum and its alloys. His close association with the Aluminum Company for many years, during which the development of duralumin was in progress, has made him intimately familiar with light alloys.

PLAN INSPECTION TRIPS

The American Society for Steel Treating, which has taken the responsibility of leadership during Convention Week, has arranged a series of plant inspection trips. The Cadillac, Packard, Ford and Chevrolet executives have agreed to open their doors wide for the visiting engineers. They will not be treated as casual visitors, but as students with the privilege of studying any department, organization, process or other angle that is of interest to them.

EXHIBITS

A welding and cutting exposition will be held under the auspices of the American Welding Society in co-operation with the National Steel and Machine Tool Exposition. More than 300 exhibitors from all the metal-working centers of the United States and abroad will use approximately 90,000 square feet to demonstrate their equipment under actual operating conditions. A special section in Convention Hall of over 15,000 sq. ft. has been set aside for the welding exhibit. Consequently, all the exhibits will be grouped together and the thousands in attendance will have the opportunity to observe the latest and best equipment and developments in this line.

EXPOSITION OF CHEMICAL INDUSTRIES

HEADQUARTERS, GRAND CENTRAL PALACE, NEW YORK.

An interest in the coming Eleventh Exposition of Chemical Industries that has grown to a proportion three times greater than in 1921 is indicated by the fact that when the doors open at the Grand Central Palace, September 26th to October 1st, 1927, there will be from 350 to 400 exhibits, many of which will be shown and discussed for the first time. In addition to the exhibits the various chemical societies which will meet here during the exposition, are closely co-operating with the management to make this exposition the greatest in its history.

Considerable interest will be shown in recording instruments to be exhibited by Charles Engelhard, Inc., New York, designed to record capacity with and without distinction between records. This will be shown for the first time at the Exposition of Chemical Industries.

The management hopes to be able to announce may new scientific methods of measurements and instruments of precision. These new exhibits will be discussed and demonstrated as far as possible to the students during the Exposition.

TESTING MATERIALS SOCIETY

HEADQUARTERS, 1315 SPRUCE STREET, PHILADELPHIA, PA.

The International Congress for Testing Materials at Amsterdam, September 12 till September 17, 1927, that has to be considered as a first manifestation after the war of international co-operation on the subject of testing materials, promises to have the interest of the experts of many nations.

On the general meetings of the Congress the following gentlemen will read a paper: T. D. Lynch, East Pittsburgh, Pa., "Materials Testing as a Stimulus to Research."

A. Mesnager, Paris, "La Rupture des Solides."

Prof. Korber, Dusseldorf, "Das Problem der Streckgrenze."

Dr. Rosenhain, England, "Plastic Deformation and Fracture of Metals."

The subjects to be treated at the Congress are divided in three sections:

A. Metals.

B. Cement, Concrete, Stone and Bricks.

C. Miscellaneous (Oils, Rubber, Wood, etc.).

In each section twenty-seven papers will be presented. The papers will be read in English, French or German. With regard to the limited time, the speeches will not be translated during the sessions.

S. E. HUENERFAUTH
President, Metal Finishers' Equipment and Materials Association.

During the Congress a boat trip will be arranged to the new Sealocks under construction at the Harbour of Ymuiden. At the end of the congress an official banquet at Scheveningen near The Hague will take place.

The meetings of the congress will be held at the University of Amsterdam. On the days of the meeting a ladies' committee will arrange trips for the ladies—participants (Ryksmuseum, Volendam and Marken, etc.).

NEW YORK BRANCH

HEADQUARTERS, CARE OF RALPH J. SIGNORI, 127 VANDERBILT AVENUE, BROOKLYN, N. Y.

The two meetings of New York Branch were held July 8 and 22. These were presided over by Vice-President A. Grinham, on account of bereavement of our president, F. J. MacStoker, through the loss of his sister.

The first meeting was on nickel formation, telling of the different deposits; also the r. p. m. of different sized coloring wheels to use for nickel coloring. This was given by William Voss. The third prize for his paper on "Colors Upon Metals," won by T. A. Gardner, was presented to him by Mr. Straub.

The subject of the July 22 meeting was the use of atomic and molecular weights, to find weight of metal in a compound. This paper was by J. Haas.

AMERICAN CHEMICAL SOCIETY

HEADQUARTERS, MILLS BUILDING, WASHINGTON, D. C.

The American Chemical Society held a meeting in Detroit, Mich., September 5-10, 1927, at the Statler Hotel. Among the papers read were the following:

J. A. Mathews. Metallurgy and Motors.

W. H. Gillett. Miscellaneous Non-Ferrous Metals and Alloys in Automotive Transportation.

Francis C. Frary. Aluminum and Its Alloys.

Lowell H. Milligan. Abrasive and Grinding.

William Blum. The Contribution of Chemistry to Electroplating in the Automobile Industry.

S. W. Parr and A. W. Coffman. The Surface Tension of Metals with Reference to Soldering Conditions.

R. V. Wilson and R. S. Dean. The Action of Fluxes in Soft Soldering and a New Class of Fluxes for Soft Soldering.

E. F. Kohman and N. H. Sanborn. Tin Plate and the Electrichemical Series.

FINISHERS' EQUIPMENT ASSOCIATION

HEADQUARTERS, CARE OF T. J. DONNELLY, JR., EASTERN FELT COMPANY, 10 HIGH STREET, BOSTON, MASS.

The Metal Finishers Equipment and Material Association will hold its second meeting on September 24-25 at the Clifton Hotel, Niagara Falls, Canada. The meeting will be called to order at 10 A. M. on Saturday, September 24th.

Personals

WILLIAM M. WEBSTER

At the recent meeting of the National Association of Brass Manufacturers, in Cleveland, Commissioner Webster was not only pleasantly surprised but most happily remembered by his friends and associates of a generation, in terminating his service under the resignation tendered at West Baden, Indiana, in March, 1926. At the luncheon, given at the Hotel Cleveland, President H. C. Bulkeley made some fitting remarks, alluding to the loyal service of the Commissioner, added to by E. F. Niedecken of the Hoffman & Billings Manufacturing Company, Milwaukee. H. L. Ottke of the Standard Sanitary Manufacturing Company, Pittsburgh, was called upon to make the presentation of some beautiful tokens, indicating the high regard and esteem in which the Commissioner was held by his associates.

Commissioner Webster was born in Iowa and spent his early boyhood days on farms in Southwestern Missouri and Texas, leaving there on the death of his father and moved to Milwaukee, where he began his business career as a messenger boy for the Western Union Telegraph Company, at the age of thirteen years. He left to embark in the plumbing line, filling all places, from office boy, learning the trade and various positions in the institution he was with, to Vice-President and General Manager. He disposed of his interests in the latter 1890's.

Arrangements incident to the disposition of his business were of a nature that he was required to remain out of the business for a period of ten years, but being in the prime of life and ambitious, he at that time studied law and later became Commissioner of and identified with a group of brass

manufacturers in 1902, which was at that time known as the Metal Workers Club. This was later changed to the National Association of Brass Manufacturers.

Commissioner Webster's method of handling matters quickly attracted captains of other lines of industry who came to him for advice and guidance and in the twenty-five years he has devoted to this particular profession, he has had no less than nine different lines of industry at one time in his office, to supervise, guide and direct their destinies.

W. M. WEBSTER

Mr. Webster will devote the rest of his life to study and travel, which he stated was the desire of himself and Mrs. Webster in tendering his resignation in March, 1926, at the West Baden meeting of the Association.

T. C. Eichstaedt has severed his connection with Divine Brothers, Utica, N. Y., and accepted a position with the Acme White Lead and Color Works of Detroit, Mich., as salesman and demonstrator of pyroxylin lacquers.

J. A. Singmaster and **F. G. Breyer**, consulting chemical engineers, Graybar Building, New York, have been engaged by the Krebs Pigment and Chemical Company of Newport, Del., for exclusive service over a period of years in the development of lithopone.

Dr. Robert J. Piersol, formerly research engineer for the Westinghouse Electric & Manufacturing Company, has changed to consulting engineering, specializing on the installation and operation of chromium plating. His address will be 3617 Dawson Street, Pittsburgh, Penna.

P. W. Blair, for the past ten years in charge of the brass valve departments of Jenkins Brothers, Ltd., Montreal, Canada, is now located at Port Hope, Ont., installing and equipping a new modern and up-to-date brass manufacturing plant for the manufacture of plumbers' and sanitary brass goods for the Port Hope Sanitary Manufacturing Company. The new plant consists of brass foundry, brass machine shop, polishing and buffing departments; also chromium plating plant, the first in the Dominion. The plant is in full operation.

Obituaries

WILLIAM F. PAGEL

William F. Pagel, President and General Manager of the Turner Brass Works, Sycamore, Ill., died at his home on August fifth. Mr. Pagel was one of the best known men in the industry in the field of gasolene combustion. Among his earlier work was the designing and making of several types of carburetors. In fact, several of the popular makes now in extensive automotive use are based on some of his designs. His big reputation and success, however, were based on his development of gasolene and kerosene burning blow torches and fire pots. In this he perfected the Turner "Master" line of torches, and fire pots.

WILLIAM F. PAGEL

Fourteen years ago Mr. Pagel went to Sycamore as the General Manager of the Turner Brass Works, then a comparatively small concern doing a general jobbing business in brass casting and sheet work. Through his efforts and ability the business prospered and grew, especially along the specialty lines of gasolene burning equipment.

In 1920 Mr. Pagel and his son Herbert F. Pagel purchased the stock of the Turner Brass Works. Then Mr. William F. Pagel became president. H. F. Pagel will succeed his father as General Manager and presiding officer of the corporation.

In the death of Mr. Pagel the industry has lost one of its outstanding figures.

FRANK A. GRING

Frank A. Gring, for seventeen years president and general manager of the Franklin Brass Foundry Company, Reading, Pa., died very suddenly at his home, 325 W. Greenwich Street, Reading, August 16th. He was 56 years old. Mr. Gring was born in Reading, the son of Anna (Moyer) Gring and the late Aaron P. Gring. At the age of 11, he entered the employ of the Wertz bakery, where he remained about three years. Mr. Gring then accepted a position with the Reading Hardware Company and was connected with that firm 23 years. In 1908 he founded the Franklin Brass foundry which he incorporated in 1910 with offices and plant at Pear and Richmond Streets. He was a member of the Schuylkill Fire Company and a member of Kissingers' Reformed Church, Spring township.

HENRY IRVING MULLIGAN

Henry Irving Mulligan, manager and treasurer of the Aluminum Die Casting Company of Garwood, N. J., died recently at his home, 1101 W. Sixth Street, Plainfield, N. J. He was born in Long Branch, N. J., and was a member of Hillgrove Lodge, F. and A. M., of Brooklyn, and St. Luke's Methodist Church of Long Branch. Surviving are his widow, two daughters, two sisters and one brother.

Mr. Mulligan was formerly associated with the Griffin Roofing Company in New York City, and became associated with the die-casting industry when he joined the Acme Die Casting Company, Brooklyn, N. Y., early in 1915, as accountant. His grasp of the business was such that he speedily assumed a leading part in the operations of that company, and in 1917 became sales manager, which office he held until 1920, when he became superintendent of the manufacturing operations. When the Acme Die Casting Company was re-organized to form the Aluminum Die-Casting Corp., Mr. Mulligan as superintendent supervised the moving of the company's operations from Brooklyn to their present plant at Garwood, N. J. He held the office of secretary of the new corporation, and in 1923 also assumed the treasurership.

FREDERICK H. LARTER

Frederick H. Larter, retired manufacturing jeweler, formerly head of Larter & Son of Newark, with New York offices at 15 Maiden Lane, died August 29, 1927, at his home Oak Road and Purrell Avenue, South Orange, N. J. He leaves five children, thirteen grandchildren and one great-grandson. Mr. Larter was born in Newark and spent most of his life there. For many years he was senior member of Elcox & Company of Newark, of which he became a partner in 1869. The firm later changed its name to Larter & Sons. Mr. Larter was formerly President of the National Jewelers' Board of Trade and an official of other trade organizations.

GERALD JUDSON MARCY

Gerald Judson Marcy, 69, superintendent of the Benson Rolling Mill Company, Glen Ridge, N. J., from 1920 to 1926 and before that superintendent of the Miller Company of Meriden, Conn., died in Meriden, Conn., August 30, 1927.

NEWS OF THE INDUSTRY

Industrial and Financial Events

Large Increase in Production of Secondary Metals in 1926

The recovery of certain metals from secondary sources in 1926 is reported to the United States Bureau of Mines, Department of Commerce, as $274,540,900, which is $30,970,200 more than in 1925. This large increase in the total value of the recovered metals, according to J. P. Dunlop, who compiled the figures, occurred notwithstanding a lower yearly average price for all the metals covered in the inquiry other than for tin and nickel. The increases in the recoveries of copper, brass, lead, and antimony were very large.

The smelters that treat mainly ore recovered 112,559 tons of copper from scrap which was 13,000 tons more than in 1925. Part of the increase of 28,500 tons of copper in brass, was due to the decrease of the exports of brass from 48,189 tons in 1925 to 25,132 tons in 1926.

The smelters that treat mainly ore recovered about 3,000 tons less lead from scrap and drosses than they did in 1925 but the secondary smelters recovered about 15,000 tons more lead. The increased quantities of battery plates from motor cars probably accounts for most of this large increase though the regular smelters reported an increase of more than 2,000 tons of lead in antimonial lead scrap.

Zinc recovered by redistillation increased more than 1,600 tons and that recovered by sweating and remelting more than 1,500 tons. The largest increase in zinc was that obtained from scrap alloys. The quantities of lithopone, zince dust and zinc chloride made from drosses and skimmings were considerably less in 1926 than in 1925 and zinc dross exports declined about 5,500 tons.

The secondary tin recovered increased about 2,400 tons partly owing to the treatment of large quantities of old cans and tin plate clippings. Tin plate clippings treated increased 22,000 long tons and old cans treated more than 10,700 long tons. Most of the old cans were handled by a new plant at Los Angeles.

The quantity of secondary nickel recovered increased considerably which was expected with the increased use of nickel non-ferrous alloys. Recoveries of secondary antimony increased 73 per cent, while the reported recoveries of secondary aluminum in 1926 were about equal to those of 1925.

Secondary metals of certain classes recovered in the United States in 1925-26:

	1925		1926	
	Short Tons	Value	Short Tons	Value
Copper, including that in alloys other than brass	250,600	$71,170,400	281,700	$78,876,000
Brass scrap remelted	242,300	56,270,000	283,000	65,918,000
Lead as metal	112,420	39,477,100	125,000	44,368,000
Lead as alloys	114,460		152,300	
Zinc as metal	61,430	11,359,000	64,570	11,700,000
Zinc in alloys other than brass	13,300		13,430	
Tin as metal	7,950	35,165,400	9,750	42,511,500
Tin in alloys and chemical compounds	23,000		23,650	
Antimony as metal	1	3,794,000	2,910	5,164,400
Antimony in alloys	10,839		20,500	
Aluminum in metal	17,700	24,816,000	20,500	23,868,000
Aluminum in alloys	26,300		23,700	
Nickel as metal	191	1,518,000	485	2,135,000
Nickel in nonferrous alloys and salts	2,109		2,565	
	.....	243,570,700	.....	274,540,900

NEW CHROMIUM MERGER

United Chromium, Incorporated, has been formed for the purpose of developing to the fullest extent the practical application of chromium plating and of making known to American Industry its many definitely established uses and advantages.

The assistance of this corporation, through its research and engineering organizations, is offered to manufacturers and others interested in the possibilities of chromium plating, that they may utilize to the best advantage the many years of research work and experience of the pioneers in the field.

The processes covered by the patent rights owned or controlled by United Chromium, Inc., are the result of many years of experimentation and development by the Union Carbide and Carbon Research Laboratories, Inc., and the laboratories of the Chromium Corporation of America and its predecessors, and are those heretofore owned or controlled by the Chromium Corporation of America, Electro Metallurgical Company and General Chromium Corporation.

The licensing agents of United Chromium, Incorporated, are: Chromium Corporation of America, 120 Broadway, New York; General Chromium Corporation, 3220 Bellevue Ave., Detroit, Mich.

The directors are: Andrew E. Baldwin, Detroit, president, General Chromium Corporation; Fred J. Fisher, Detroit, vice-president, General Motors Corpoation; F. H. Hirschland, New York, president, Chromium Corporation of America and Metal and Thermit Corporation; Benjamin O'Shea, New York, vice-president, Union Carbide & Carbon Company; Hubert E. Rogers, New York; F. M. Becket, New York, president, Union Carbide & Carbon Research Laboratories; C. Roy Gleason, Chicago; William F. Barrett, New York, vice-president, Union Carbide & Carbon Company; John T. Pratt, Jr., New York; R. C. Stanley, New York, president International Nickel Company; F. S. Wheeler, New York, chairman of the board American Can Company.

Patent Counsel: Livingston Gifford and C. P. Townsend.

EASTERN WIRE BUYS HABIRSHAW

The Eastern Wire and Cable Company, New York, which was organized under the laws of the State of Delaware, has purchased through Potter & Company, New York, more than 100,000 of the total 170,000 voting trust certificates of the Habirshaw Cable and Wire Corporation, Yonkers, N. Y., and, at the request of the voting trustees and in order that all certificate holders should have the same opportunity to sell, they have authorized Potter & Co., on their behalf to offer the same price, $25 a share, for all or any part of the minority voting trust certificates for a period of ninety days from August 25, 1927.

The officers of the Eastern Wire and Cable Company are: William C. Robinson, of Pittsburgh, president; Franklin S. Jerome, of Seymour, Conn., treasurer; Wylie Brown, of New York City, vice-president; I. A. Bennett ,of Pittsburgh, secretary. These four gentlemen constitute the board of directors. Mr. Robinson is president and Mr. Bennett is vice-president of the National Metal Molding Company of Pittsburgh, and Mr. Jerome is president and Mr. Brown is vice-president of the American Copper Products Corporation of Elizabeth, New Jersey.

The purchasers are not at this time considering any merger sale of securities or changes in connection with the stock or status of the Habirshaw Cable and Wire Corporation.

INCORPORATIONS

Metals Processes, Inc., 155 Chambers Street, New York, has been organized to act as representative in the New York territory for the New Haven Sherardizing Company, Hartford, Conn., and the Chromilite Process Corporation, Akron, Ohio. This firm operates a zincing and electro-plating department.

The **Taylor Bumper Company,** 1775 Broadway, New York, has been organized to manufacture automobile bumpers. The company operates a factory at 222 West Sixty-eighth Street, and is in the market at all times for castings, tubing, spring steel, nickel plated work, nuts, bolts and other materials.

The **Grant Accessories Corporations,** 107 Liberty Street, New York, have been organized to make oil burning equipment. The company expects to manufacture under contract and present work is being done by the Porter Machine Company, 115 Plymouth Street, Jersey City, N. J. This firm operates the following departments: brass, bronze and aluminum foundry; stamping, grinding room.

MACHINERY BUILDERS TO MERGE

Merger of the Farrel Foundry and Machine Company of Ansonia, Conn., and Buffalo, N. Y., and the Birmingham Iron Foundry of Derby, Conn., was proposed in a notice to stockholders of the two companies sent out August 17. A meeting will be held on September 20 to act. Both companies are among the oldest in the country, specializing in heavy machinery such as used in the sugar, rubber, paper, brass and copper industries. Combined they have 1,600 employes and a weekly payroll of nearly $60.00. The Birmingham Iron Foundry is in no way connected with the Birmingham Machine & Foundry Company of Birmingham, Ala.

WIRE MERGER

The Inland Wire and Cable Company, Sycamore, Ill., has been organized as a result of a consolidation of the Chicago Insulated Wire and Manufacturing Company and the Illinois Wire and Cable Company, for the manufacture of their bare copper wire, weather proof cable, magnet, annunciator, office and radio wire. An issue has been placed of 25,000 shares of common stock at $26.50 per share, on which it is planned to establish dividends at the rate of $2.00 per share per year.

GAUTIER COMPANY LIQUIDATES

J. H. Gautier Company, Jersey City, N. J., has liquidated its stock of crucibles, brick and graphite products and has placed its real estate and buildings on the market for sale or lease. The management of the real estate is in the hands of Ryer-Hague, realtors of Jersey City. There is some machinery for sale in addition.

The Gautier company was founded in 1859 and the founders died a few years ago. The heirs are retiring from this business.

Business Reports of the Metal Industry Correspondents

NEW ENGLAND STATES

WATERBURY, CONN.

SEPTEMBER 1, 1927.

John A. Coe, president of the **American Brass Company,** last month refuted the recently published statement of **Roger K. Babson** that the public has never had a square deal in connection with copper statistics. "I do not quite understand whether Mr. Babson means that the producers are giving out incorrect or incomplete information regarding production, consumption and other statistics," he said. "He neither explains nor proves his point." Mr. Coe said that the producers dare not give out incorrect information as they are closely checked by the government, and in the second place there is no incentive to do so. There has been a curtailment in production of copper due to lack of demand, he said, but the idea of purposely depressing the price in order to freeze out the smaller producer, hinted at by Mr. Babson, was scouted by Mr. Coe.

"The government would make it hot for the larger producers if they attempted that sort of a thing," he said, "and if we collaborated against the independents we would go to Atlanta." Supply and demand, modified by production costs, control the price of copper the same as other commodities, he said.

William B. Goodrich of New Haven, treasurer of the **Thinsheet Metals Company,** of Waterbury, misappropriated more than $13,000 of the funds of the local company, according to the prosecutor of New Haven city court. Mr. Goodrich was also president and treasurer of **Goodrich & Company,** stock brokers of New Haven and was arrested last month, charged with embezzlement of funds sent the brokerage firm by clients for investment. His misappropriation of the local concern't funds was brought out in his examination for the New Haven embezzlement, following which he was bound over to the superior court under bonds of $25,000. According to the prosecutor, he has confessed to most of the embezzlements charged. **Joseph L. Rigney**, vice-president of the local concern, **Henry T. Cross,** vice-president, and **Wendel Cross,** secretary, refuse to comment upon the situation except to say that the embezzlement will not affect the financial condition of the company. It is capitalized at $250,000.

Police of all surrounding cities have been notified to arrest **Douglas M. Godfrey,** former office manager of the local plant of the **Chromium Corp. of America,** who has been missing for several weeks, after a shortage of $1,250 was found in his accounts. **R. E. Cleveland**, general manager of the local plant, suspected the shortage when checks began to come back to the company unpaid from the banks and when local merchants refused to honor the checks because of Godfrey's activities. Louis Strayer, auditor of the New York office, came on and discovered the shortage. Mr. Godfrey also managed a local collection agency and the fixtures of the agency have been attached by the company. Mr. Cleveland emphasized the fact that the shortage will not affect the concern in the least as it is a $14,000,000 corporation.

The **Waterbury Farrel Foundry & Machine Company** is not affected by the recent merger of the **Farrel Foundry & Machine Company** of Ansonia with the **Birmingham Iron Foundry** of Derby. The two Farrel foundries were originally under the same ownership but they separated a number of years ago.

W. H. Bristol, president of the **Bristol Company** of this city and inventor of many electrical recording instruments, for some time has been experimenting with synchronization of moving pictures with the phonograph. Last month, in collaboration with **Henry Ford** and **Thomas Edison** he took a phonographic motion picture of the childhood classic, "Mary's Little Lamb" at Mr. Ford's farm at Sudbury, Mass. The plan is for a series of such childhood subjects for the education and entertainment of children.

Arthur Reed Kimball, a director of the **Chase Companies, Inc.,** and other local concerns, has been elected president of the **Connecticut Chamber of Commerce**. In taking over his new duties he urged co-operation in industry and keeping up with all forward movements. Industries, he said, are finding that though they are competitive, they must cooperate if they are to be successful.

Among patents granted to local inventors during the past month are the following: **Henry Rochette,** assignor to the **Scovill Manufacturing Company,** electric relay, consisting of a polarized movable circuit controller, and actuator fields located on opposite sides of the controller; **John L. McAttee,** assignor to the **Scovill Manufacturing Company,** two patents on vanity cases and boxes; **Ralph Emerson,** assignor to the

Scovill **Manufacturing Company**, heating system; **Steele & Johnson Company**, non-electric cigar lighter; **Lincoln Thompson** of Naugatuck and **Joseph Marshall** of Westport, assignors to the **Bristol Company** of this city, electrical pick up device; **Adolph Recker**, assignor to the **Chase Companies, Inc.**, socket casing.

F. S. **Chase**, president of the **Chase Companies, Inc.**, has been appointed to the American Industry Committee of One Hundred by the National Association of Manufacturers.

Employes of the **Scovill Manufacturing Company** and its subsidiaries, the American Pin Co. and the **Oakville Company**, numbering 2,000, held their annual outing at the company's reservoir and recreation grounds in Wolcott, Aug. 20. Prizes were donated by officials of the company, free transportation was provided by the company and dinner and refreshments were provided at a nominal price.—W. R. B.

BRIDGEPORT, CONN.

SEPTEMBER 1, 1927

Edgar **W. Bassick** of this city, as head of the **Relay Motors Corporation** of Wabash, Ind., has just completed negotiations for the purchase by his concern of the **Garford Truck Company** of Lima, Ohio. His concern also recently acquired the **Commerce Truck Company** of Ypsilanti, Mich and the **Service Motors, Inc.**, of Wabash. The assets of the combined companies will be about $10,000,000. Mr. Bassick was the founder of the **Bassick Company** of this city, which later acquired the **Alemite Company** of Chicago and combined the two under the name of the **Bassick Alemite Company**. About three years ago he sold this company to the **Stewart-Warner Company**, taking an interest in the latter concern. The latter concern operates Bridgeport and Chicago plants and also plants in Meriden, Conn., and Newark, N. J. It recently called in all its preferred stock at a premium of $10 a share. The new company which Mr. Bassick has created by the merger of the three concerns first mentioned will be known as the **Relay Garford Company** and will apply the Relay pneumatic axle principle to the Garford trucks.

Willis F. Hobbs, president of the **Bridgeport Hardware Manufacturing Company**, has been appointed a member of the American Industry Committee of One Hundred, which will draw up national planks for submission to the major political parties at their conventions in 1928. It will hold its first meeting this month in New York.

Among patents granted local inventors during the month are the following: **Carl W. Tillmanns**, assignor to the Remington Arms, improved can opener; **Raymond Moore**, assignor to the **Bassick Company**, automobile hood and **Maxwell C. Maxwell**, assignor to Yale & Towne, Stamford, cylinder lock.

Due to the urging of local citizens, the entire water piping system in the federal post office building here will be removed and replaced with brass piping. The supervising architect of the treasury department in Washington has called for bids for furnishing and installing it. Considerable leakage has resulted from corrosion of the old iron piping.

The wiring supplies division of the **General Electric Company** held its annual outing at Black Rock, Aug. 13. Supt. **David Hayes** and **Ford Ennis** were the guests of honor. About 300 were present. The committee consisted of **John McCann, A. F. Mills, W. Curtis, B. Dorfchak, Timothy Arnold, John Darcey and B. Ingraham.**—W. R. B.

CONNECTICUT NOTES

SEPTEMBER 1, 1927

HARTFORD—A merger of the **Arrow Electric Company** and the **Hart & Hegeman Company** is to take place shortly according to statements of the officials of both concerns, resulting in the creation of a five million dollar corporation, which the officials state will be one of the world's largest organizations manufacturing wiring devices. The former has three factories here and one in Washington, N. J., while the latter has two plants here, one in Trenton and one in Philadelphia. The officers of the Arrow Company are: President and Treasurer, **Charles G. Perkins**; vice-president and general manager, **Edward R. Grier**; secretary and assistant treasurer, **Benjamin C. Perkins**; assistant secretary, **Charles Ten Eyck.** The officers of Hart & Hegeman: President and treasurer, **Samuel P. Williams**; vice president, **Monroe Guett**; secretary, **Robert Buell**; assistant treasurer, **E. C. Swan**; assistant secretary, **E. E. Sage.**

The **Royal Typewriter Company** has purchased a triple-motored plane for delivering rush shipments to all parts of the country. It was tried out last month by dropping a box containing three typewriters 500 feet by parachute, the box landing on Brainard field here without damage to the machines. A shipment of typewriters will be delivered by the plane to Havana, Cuba, this month.

Clarence E. Whitney, president of the **Whitney Manufacturing Company**, has been named to the American Industry Committee of One Hundred, appointed by the National Association of Manufacturers to draw up planks for submission to the major political parties in 1928.

D. Hayes Murphy, president of the **Wiremold Company**, attended the convention of the Association of Electragists International at St. Louis last month. He is vice president of the supply division of the National Electrical Manufacturers association and spoke on "The Manufacturer's Viewpoint."

NEW BRITAIN—General Manager **Isaac Black** of the **Russell & Erwin Division** of the **American Hardware Corporation** announces the appointment of **W. Manville Johnson** as assistant to the general manager. He has been in the office of President Loree of the eDlaware & Hudson. Mr. Black also announces the appointment of **John A. Mansergh** of Los Angeles as sales manager of the company, the position formerly held by Mr. Black before his recent promotion to be general manager. He has been in charge of California sales for several years.

NEW HAVEN—Manufacturers from all over the East are expected to have exhibits at or attend the **Seventh Annual Machine Tool Exhibition** to be held here at the Mechanical Engineering laboratory of Yale University, Sept. 6 to 9th. The committee in charge states that there is a movement on foot which forecasts general re-equipment of metal working plants in this part of the country which it expects will mean that the exhibit will be a lively shopping center as well as providing an educational opportunity. It will provide the first national meeting of the machine shop practice division of the American Society of Mechanical Engineers. Lectures will be given on machine and tool subjects and in addition there will be talks on metal subjects such as **"Fundamentals of Polishing"** by **B. H. Divine** of **Divine Brothers**, Utica, **"Manufacture and Application of Extruded Tubes"** by **G. A. Foisy**, superintendent of the radiator division of the **Winchester Arms Company**, and **"Improvements in Copper Wire Mill Equipment"** by **John R. Shea** and **John L. Alden** of the **Western Electric Company.** The committee points out that within 500 miles of New Haven there are 13,393 metal working plants or about 90 percent of the entire country.

STAMFORD—A decision by **Federal Judge E. S. Thomas** last month gives the **Yale & Towne Manufacturing Company** of this city an injunction against the **Yale Electric Company** of Brooklyn, forbidding the latter to use the word "Yale" as a trademark. Litigation over the matter has been in progress since 1923. The judge said the question was the significance of the name in the hardware field and the fact that the products of the two companies are sold in the same stores and advertised in the same journals. The local company, he ruled, was in the field long before the Brooklyn company adopted the name.

TORRINGTON—Increased earnings and the prospects of a substantial extra dividend soon has boosted the stock of the **Torrington Company** to the highest point in several years, 79 bid and 81 asked.

WINSTED—The **William L. Gilbert Clock Company** celebrated its 120th anniversary last month. A sales conference was held and a pageant, depicting the style of clocks made by the company since its beginning. **William L. Gilbert**, son of the founder, was the town's greatest benefactor, leaving an

estate of $1,000,000 for the **William L. Gilbert Home** and the **Gilbert School. Willis A. Drake**, a lineal descendant of the founder, who has been employed by the company for more than 50 years, presided at the pageant, dressed as Father Time, showing clocks made over 100 years ago.

MERIDEN—Henry F. Hart, foreman for 32 years of the **William Rogers Manufacturing Company**, branch of the **International Silver Company**, died in Hartford hospital Aug. 10. He was the inventor of a burnishing machine used exclusively by the company for many years. He received a medal from the Columbian exposition for this invention.

MIDDLETOWN—The plant of the **New England Enameling Company**, valued at $700,000, for years maker of high grade kitchen utensils of aluminum, galvanized metal and enamelware, will be sold at public auction Sept. 7 by order of the receivers. Land, buildings, and all the machinery used in making the utensils are included.

ANSONIA—The directors of the **Farrel Foundry & Machine Company** of this place and the directors of the **Birmingham Iron Foundry** of Derby have voted to merge the two companies, subject to ratification by the stockholders. Both specialize in heavy machinery such as used in the brass and copper industries, particularly rolling mills. The local company also has a plant in Buffalo, N. Y. The amalgamated company will be known as the **Farrel Birmingham Machinery Corporation.** There will be no important changes in the management and the officers of both companies will be active in the new corporation. The local company, according to a recent announcement by the New England Council, has received orders during the past few months which will make an unprecedented record in the history of the firm. The **Derby Company** has also received an unusually large number of orders lately.—W. R. B.

PROVIDENCE, R. I.

SEPTEMBER 1, 1927

Rhode Island's supremacy as a producer of fine machine tools is regarded in the principal markets of the world, and it is reflected in the leadership of those commodities in the export business for 1926, heading the list with a total of $1,791,223, according to figures just available from Washington. Jewelry exports that did not go out of the country via the parcel post route were valued at a total of $344,337 and gold-plated articles were given an aggregate valuation of $141,181. Brass and bronze articles valued at $559,569 were exported and copper and manufactures to the amount of $562,325.

The Brown & Sharpe Manufacturing Company is shipping large quantities of hair clippers and various small tools together with fine measuring and gauging tools to England and France, both countries proving good markets. While Germany is said to be a strong competitor of the tool makers of this country, she is not seriously affecting the tool manufacturing business of the United States, it is pointed out by those in close touch with the situation. Anent this greatest tool manufacturing plant in the world, it is interesting to note that it grew out of a small tool producing business begun on South Main street, Providence, nearly a century ago, having been founded in 1833. There are now ten main manufacturing buildings, having a total of about 900,000 square feet of floor space; a foundry with about 245,000 square feet of floors, and other floor space aggregating 252,000 square feet. By way of contrast it may be said that the concern's floor space in 1853 was only 1,800 square feet, compared with the present 1,397,000 square feet of floor space, or more than 32 acres of it. The plant has about 5,000 pieces of machine tool equipment in use that are driven entirely by more than 500 electric motors, the entire plant having been electrified. The normal operating capacity of the plant is approximately 6000 employes.

The **Scullion Jewelry Company, Inc.**, of Providence, has been granted a charter under the laws of Rhode Island to conduct a manufacturing jewelry business with a capital consisting of 100 shares of common non-par stock. The incorporators are Daniel A. Scullion of Pawtucket and Hugh F. Scullion and Donald O. Burke, both of Providence.

The **New England Lacquer Company**, of East Providence, has filed a statement at the office of the Secretary of State, announcing that its capital stock has been increased from $20,000 to $30,000.

An increase in the capital stock of the **Allen Wrench and Tool Company** of Providence, from $100,000 common to $100,000 preferred and 2000 shares common without par value, is made in an amendment that has been filed at the office of the Secretary of State.—W. H. M.

MIDDLE ATLANTIC STATES

NEWARK, N. J.

SEPTEMBER 1, 1927

The **Colonial Art Metal Works** have leased a building at 30 Branford Street and will use it for the manufacture of all kinds of wrought iron products and metal novelties. These are used for interior and exterior house decorations.

Application for a permit to erect a $100,000 factory on Free Mills Road, Linden, N. J., a residential section, to the **Radio Clock Company**, was granted by the Board of Zoning Adjustment. No objection to the permit was made.

Sturdy Manufacturing Company, of East Orange, has been incorporated with $200,000 capital and will lease a plant for electrical manufacturing and engineering.

Ludwig Zimmer, Inc., of Newark, will engage in refining metals. The company begins business with 100 shares, no par.

Reliance Electric Wiring and Fixture Supply Company, of Newark, was incorporated with $125,000 capital to manufacture batteries. The company will operate at Morristown. The incorporators are: **Ralph E. Shaner** and **Ethel C. Tuchig**, of Morristown, and **Daniel T. Tuchig**, of Chatham, N. J.

New Brunswick Chemical Company, Newark, N. J., was chartered with $10,000 to deal in chemicals. The incorporators are **Arthur H. Jones** and **Jerome Jones**, of New York, and **Charles Setterstrom**, New Brunswick.

The **Hanson-Van Winkle-Munning Company**, of Newark, was chartered with $300,000 capital preferred and 16,000 shares common to manufacture chemicals and electrical appliances. —C. A. L.

TRENTON, N. J.

SEPTEMBER 1, 1927

Metal conditions do not show any improvement at some of the Trenton plants, while other concerns report business as picking up a little. The **Jordan L. Mott Company** is now operating five days a week and the **John A. Roebling's Sons Company** also finds business much better. **The Skillman Hardware Manufacturing Company** reports that while business is not so brisk, it has not been compelled to lay any hands off.

Sauzedde Corporation, of New Brunswick, N. J., will erect a plant for the manufacture of wire, disc and metal wheels. The company was chartered with $500,000 capital preferred and 52,000 shares common, no par. The incorporators are: **Henry S. Thomas**, Highland Park, N. J.; **David T. Libby**, Bergenfield, N. J.; and **Margaret A. Harkins**, New Brunswick.

Other concerns incorporated at Trenton were: **Frank A. Menchik, Inc.**, electical appliances, Hackensack, $125,000; **Avel Chemical Company**, chemicals, Jersey City, $25,000 preferred and 500 shares common, no par; **Harco Steel Company, Inc.**, Elizabeth, conduct brass foundry, $125,000; **Neonlite Corporation of America**, manufacturing electrical supplies, Irvington, N. J., $125,000 preferred and 2,000 shares common, no par; **Camden Peerless Company**, manufacturing generators, Camden, N. J., 1,000 shares, no par; **Jay-Bee Electric Company**, electrical appliances, Camden, N. J., 1,000 shares, no par; **General Metal Manufacturing Company**, Orange, N. J., manufacturing metal goods, $125,000 capital; **Detectol** Manu-

facturing Company, Inc., Carlstadt, N. J., manufacturing chemicals, 100 shares, no par; **Bergen County Magneto and Generator Company,** Hackensack, N. J., manufacturing magnetos, $6,000 capital; **Seta Process Company,** Homestead, N. J., 100 shares, no par stock, manufacturing chemicals.—C. A. L.

MIDDLE WESTERN STATES

TOLEDO, OHIO

SEPTEMBER 1, 1927

The eighth annual outing of the **Bunting Brass & Bronze Company** was held on July 26 at Vollmar's park with contests, games, amusements and an ox roast. Free use of the boats, bath house, miniature train, dance hall and other park concessions were given the picnickers. It proved to be a grand and glorious occasion.

Employes of the **DeVilbis Manufacturing Company** and their families, about 2,000 in all, took part recently in the annual picnic at Cedar Point. There were no races or contests, but there is no better bathing anywhere than at Cedar Point. There also are plenty of amusements.—F. J. H.

DETROIT, MICH.

SEPTEMBER 1, 1927

An expansion program involving an expenditure of approximately $1,400,000 is announced by **O. B. Mueller,** president of the **Mueller Brass Co.,** of Port Huron, Mich. Several new buildings will be erected and about 600 more employees taken on from time to time, it is stated. All of these additional activities will be spread over a period of five years.

An expenditure of between $275,000 and $300,000 for an 80-foot extension of the rod and tube mill buildings, and a 40 by 160-foot brass rod and tube stock building and equipment, which will increase production in the rod and tube mills by 50 per cent, are among the leading plans. These improvements also will permit a possible production increase of 100 per cent in the casting shop; 15 per cent in the hammer shop; 12 per cent in the brass shop; 5 per cent in the sand foundry; 15 per cent in the nickel plate department and 100 per cent in the power house. Other expenditures include between $225,000 and $275,000 in 1928, for new sand foundry equipment; a metal storage building and a new administration building. From 1928 to 1931 the expansion program will depend upon general business conditions, according to Mr. Mueller, but during this period in the neighborhood of about $300,000 will be spent annually. The general plan of expenditure provides about one-third of the entire funds for new buildings and two-thirds for equipment, it is understood. The Mueller Brass Company buildings cover approximately 18 acres. The fixed assets of the company are set between $2,500,000 and $2,750,000. It manufactures brass rods, brass and copper tubing, brass forgings and screw machine products.

The **Bohn Brass and Aluminum Company** at Detroit for the six months ending June 30, reports net profits of $603,000 after all charges, equivalent to $1.73 a share on the 347,684 shares of no par outstanding stock. The company reported net profits of $324,237, or 93 cents a share for the first quarter.

The **Henry Steffens,** copper tube manufacturing plant, now located at Detroit, contemplates, it is stated, moving to Tecumseh, Mich.

The **Industrial Foundry & Brass Works** has been incorporated at Mt. Morris, Mich., with a capital stock of $12,000. It will do a general foundry and machine business. The owners are **Charles W. Kist,** Mt. Morris, and **G. Alexander Olofsson** and **Joseph Laro,** Fenton, Mich.

Net earnings of the **Bohn Aluminum & Brass** corporation for the first half were $1.73 a share against $2.45 a share for the entire year of 1926.

Persons in every line of industry seeking employment are advised to remain away fram Detroit at this time as there is far from sufficient employment to care for permanent residents. It is estimated that more than 40,000 persons are idle in Detroit today. Industry is at a low ebb, particularly in the motor car field. This condition is no different than that found in the majority of large manufacturing centers. A decided improvement, however, is forecast for the near future.—F. J. H.

MILWAUKEE, WIS.

SEPTEMBER 1, 1927

The brass and copper industry throughout this part of the country is receiving a very good volume of business at the present time. Building activities are concentrated largely through the northern part of Illinois and southern part of Wisconsin, which means that Chicago and Milwaukee firms are getting their share of the orders.

Building in surrounding territories is also on the up trend but not on so active a scale as near Milwaukee and Chicago where the programs are bigger than ever before. Brass foundries are all kept pretty busy and there seems to be no indication of any slowing in the demand for some time to come.

Consolidation of the **Superior Metal Products Company,** Kenosha and of the **Kenosha Plating Company** was announced last month. The two companies were engaged in different branches of metal working. The new company will retain the name of the **Metal Products Company.** It will be located in a plant formerly occupied by the **Superior Brass Company.** The announcement of the merger stated that the increase of business of both firms had made it necessary to have larger quarters which could be secured by the consolidation.

The **Anchor Company** has been formed in Milwaukee and will deal in a general metal manufacturing and jobbing business. Incorporators are **L. Fichauz** and **F. John.**

The **Wisconsin Iron & Metal Company,** Oshkosh, Wis., whose plant burned to the ground a few months ago, is busy erecting a new plant, according to the officials.

George S. Hamilton of Two Rivers, Wis., manager of the **Hamilton Manufacturing Company,** consisting of aluminum and cabinet factories, has purchased sixteen forties of land at Peshtigo, Wis.

Work is progressing rapidly on the new addition being built by the **Leyse Aluminum Company,** Kewaunee.—A. P. N.

OTHER COUNTRIES

BIRMINGHAM, ENGLAND

AUGUST 15, 1927

Any doubts as to the future of Cornish tin mining are dispelled by **Lord Askwith** at the ordinary general meeting of the **Wheal, Kitty Tin, Ltd.,** held in London August 4. Lord Askwith, who presided, assured the shareholders that the introduction of modern mining methods and the establishment of a reasonable price basis for tin clearly foreshadowed the dawn of a new and highly successful epoch for the ancient industry.

Speaking at the annual meeting of the **National Smelting Company, Ltd., Sir Robert Horne,** chairman of the company, said that their works at Avonmouth and Swansea Vale have been equipped with mechanical blend roasting furnaces and sintering machines, and in both cases mechanical handling and special storage arrangements have been installed. Moreover at Swansea Vale a new acid plant had been set up and two extra units of the Avonmouth plant had been brought into operation. The experiments the company were making indicated that material alterations were likely to become necessary in the processes dealing with the production of zinc.

The metal works of Birmingham are rather quiet owing to the usual holidays. A slightly improving tone, however, is reported in tubes although the business is rather patchy, some firms being well situated while others hardly have enough to

keep mills at work. A disquieting feature in the brass trade is the continuance of keen foreign competition. Export demand is no better and Australia and New Zealand which can generally be relied upon to provide good business has shown some falling off during the last few weeks. The motor car industry of the district which uses large quantities of metal fitments of many grades is less active, with a consequent slackening of demand upon Birmingham producers of such accessories. The firming up of copper has resulted in an advance of one farthing per pound in the price of brass wire, making the basis 9½d per lb. In the North West of England copper has been in better demand, especially of rough bar material. The tinplate industry of South Wales is severely depressed and only about 40 per cent of the mills are at work with prices showing decided weakness.

The jewelry trade of Birmingham shows no improvement and the parlous state of the industry may be judged from a recent estimate which states that those employed in the trade today do not number more than a fifth of those engaged in pre-war days. Many firms, some of them old established and household names in the trade, have become extinct during recent years. The change of fashion has had a great deal to do with the decline, the use of brooches, buckles and clasps having no part in the present day feminine make-up. At the beginning of the summer season some firms in the electro-plating department found a slight fillip in business attributable to preparations at the holiday resorts, but this activity is on the wane. Makers of medals, cups and trophies have had a fairly active run but the season is practically over. Foreign trade is described as dull except with South America which calls for a certain quantity of high class diamond goods.

Most of the orders, particularly from the Argentine, call for elaborate and showy designs, as large and showy ornaments are the rule for rich ranch owners who have no scruples about price.—J. H.

Business Items Verified

The **Akron Barrow Company**, Cleveland, Ohio, has changed its name to the **General Wheelbarrow Company** of the same address.

The **George A. Stutz Manufacturing Company**, Chicago, Ill., has increased its quarters and now occupies the entire lower floor of the building at its present address, 1641 Carroll Avenue, Chicago, Ill.

The **Chaplin-Fulton Manufacturing Company**, 36 Penn Avenue, Pittsburgh, Pa., manufacturer of gas regulators, governors, steam specialties, etc., has acquired adjoining property, 30 by 110 feet, for expansion.

Woolwine Metal Products Company is erecting three factory buildings at 52nd Street and Atlantic Avenue, Los Angeles, Calif., at an estimated cost of $90,000. This plant will be in operation November 1st. A stamping department will be operated.

The **Vesuvius Crucible Company**, Swissvale, Pa., reports that the fire which occurred on August 1st in the plant caused operations to be interfered with, but that the repairs are now about made. The plant is in daily production, and the loss, which was considerably less than $75,000, is covered by insurance.

Among the recent installations of electric furnaces by **Charles F. Kenworthy, Inc.**, Waterbury, Conn., are: One of 224 kw. capacity for Standard Underground Cable Company, Hamilton, Canada; one of 305 kw. capacity for Allegemeine Elektricitats-Gesellschaft, Berlin, Germany; one of 168 kw. capacity for Rio de Janeiro Light & Power Company, Rio de Janeiro, Brazil.

The **Stamford Rolling Mills Company**, Springdale, near Stamford, Conn., manufacturer of brass sheets and other rolled brass specialties, has rebuilt the portion of its plant which was slightly damaged by fire, and is now running full capacity. This firm operates the following departments: rolling mill, cutting-up shop, stamping, tool room, casting shop.

The **Hoskins Manufacturing Company**, 4435 Lawton Avenue, Detroit, Mich., manufacturer of electric furnaces, pyrometers and resistance wire, is completing plans for a new one and two story addition, 80 x 290 ft., reported to cost close to $100,000 with equipment. This firm operates the following departments: tool room, rolling mill, polishing, nickel alloys.

The **Earle Gear & Machine Company**, with main office and plant at 4707 Stenton Avenue, Philadelphia, Pa., announces the opening of a New York District Office at 95 Liberty Street, New York City. C. N. Walsh and George E. Barrett are in charge. This company also maintains a district office in charge of Wm. H. Allen at 110 State Street, Boston, Mass.

Richard Goedecke, president of Machinery Inspection Service, 31 West 14th Street, New York City, has sent out requests for current catalogues of machinery for use in all lines of manufacturing. In conjunction with its "Inspection Service" this organization maintains in its New York office a complete file of catalogues available at any time for the use of manufacturers and dealers.

The **Advance Wheel Manufacturing Company, Inc.**, Chicago and Detroit, has recently installed at the Chicago factory a mill for the purpose of grinding their sheepskin leather into leather meal. This Advance leather meal is being produced in three different sizes, namely, No. 1, No. 2 and No. 3, and is packed in bags of 100 pounds net each. Samples of any of the above grades of Advance leather meal or all three grades can be had upon request.

Milwaukee Valve Company, Milwaukee, Wis., manufacturer of valves and other plumbing and heating brass goods has increased its capital from $100,000 to $250,000. Val Fina, formerly president and general manager, Clum Manufacturing Company, Milwaukee, recently acquired an interest in the firm and has become vice president and works manager. John Fraser, Jr., is president and general manager. This firm operates the following departments: brass, bronze and aluminum foundry; brass machine shop, tool room, plating, stamping, soldering, polishing, grinding room.

The Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., has just issued a complete catalogue of industrial electric heating apparatus, designated as Catalogue 25. Twenty-seven different types of equipment are listed, including box furnaces, lead and salt baths and pots, pit, rotary hearth and pusher furnaces, special furnaces and ovens, drawing baths and ovens, baking ovens, laboratory furnaces, strip heaters of all classes, automatic melting pots, control equipment and accessories. For the standard furnaces and ovens production curves are given which enable one to estimate accurately in advance the kilowatt hours required to turn out a certain amount of steel when heated to a definite temperature. The publication is profusely illustrated to show the various apparatus and its construction.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	..	105	106
American Hardware Corporation	$100	80	82
Anaconda Copper	50	46½	46⅝
Bristol Brass	25	8	10
International Nickel, com.	25	65½	66
International Nickel, pfd.	100	105	115
International Silver, Com.	100	167½	170
International Silver, pfd.	100	120	123
National Enameling & Stamping	100	28	28½
National Enameling & Stamping, pfd.	100	88	90
National Lead Company, com.	100	119	120
National Lead Company, pfd.	100	109	110
New Jersey Zinc	100	179	181
Rome Brass & Copper	100	132	142
Scovill Manufacturing Company	..	56	58
Yale & Towne Mfg. Company	..	82½	83½

Corrected by J. K. Rice, Jr., Co., 120 Broadway, New York

HILO SALES MEETING

The sales staff of Hilo Varnish Corporation, Brooklyn, N. Y., came together at the Hotel St. George, on August 24th and 25th for their annual conference. President John H. Schumann made an address of welcome after which the meetings, under the direction of Secretary Carl J. Schumann, were devoted to discussions on Hilo Industrial Lacquer.

This house is now 64 years old. A number of new and improved specialties were announced.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of New York, Inc.

On August 2nd an advance of ¼c per pound was made in the prices of brass and copper fabricated materials. This was in harmony with the increased price of ingot copper. Since that time there has been no change in published prices, and as most consumers who buy on a reasonably large scale had covered their requirements up to about the first or the middle of September, the trade has settled down to a hand-to-mouth business again, with very few, if any, contracts of importance being placed. In fact, most of the mills are complaining of a recession in business, and are running on a schedule of five days a week or less.

Towards the end of the month there appeared a noticeable slump in buying activity with a very frankly stated attitude on the part of consumers showing a strong tendency to hold off until it has become apparent that the price of copper will be held at the present levels or that there will be volume enough in the purchasing needs to develop enough tonnage to give the markets the necessary strength to provide for an advance.

There are many expressions of optimism heard, indicating a feeling that after Labor Day there will be a resumption of business activity on a heavy scale, and business in general will pick up to a degree that will find immediate reflection in the metal trade with an improvement in demand sufficient to keep all of the mills going on full time. At this time, of course, this is only a hope, but it seems to be founded on reasoning that is sound, and has developed a feeling of security among the producers which has kept them from any great amount of worry.

Many new large contracts for public buildings have been placed during the past month or two, and in practically all of these contracts brass pipe and sheet copper are specified for the roofing and plumbing, and Monel metal for kitchen equipment and other uses where a white metal is required. Probably the largest of these contracts is the New York Life Insurance Company building on the site of old Madison Square Garden in New York City, and the new Atlantic City Convention Hall. The New York Central Office building on Park avenue, which will be one of the largest in the country, will also be equipped with brass pipe and sheet copper in very large amounts, and while it will be several months before deliveries on this contract will be made, this, together with other large projects all over the country which will consume non-ferrous metals, are supplying the background for the optimistic feeling which prevails.

Production and consumption of Monel metal have been going forward on a schedule about the same as that which has prevailed for the last two or three months, and which is well up to the average for last year. Several manufacturers of dairy products and various food products have definitely committed themselves to standardizing their equipment in both Monel metal and nickel, with the result that a number of orders of interesting size have been placed during the past month, and these have helped to a large extent to counteract the effect on the order book of the falling off in other standard lines. The producers feel that there is nothing to worry about.

Metal Market Review

Written for The Metal Industry by R. J. HOUSTON, of D. J. Houston & Company, Metal Brokers, N. Y.

COPPER

SEPTEMBER 1, 1927

There was active buying of copper in August, particularly in the first half of the month, and the domestic price for electrolytic advanced to 13⅜ cents delivered in Connecticut Valley. That was the highest market level since last March. European consumers came into the market for large tonnages, and the upward movement brought out substantial orders for export. Sentiment at home and abroad was improved by expectations that production would be curtailed at some of the important sources. World smelter output for July, by countries which furnish about 98% of the world's total, was 132,686 tons, as compared with 134,243 tons in June and 139,114 tons in May.

Refinery output in July was 118,133 tons, however, as against 113,233 tons in June, an increase of 4,900 tons. But compared with refined production in January, the July figures show a decrease of 14,977 tons. The entire trade is taking more than the usual interest in the statistical situation, and there is a strong opinion prevalent that movements of far-reaching importance will supply underlying strength to the copper situation. A firmer tone was apparent at month end, with electrolytic held at 13¼ cents delivered to Connecticut Valley points. More activity and a stronger market are expected soon.

ZINC

The month of August started rather hopefully. Inquiry was good and market firm at 6.45c East St. Louis and 6.77½c to 6.80c New York. Domestic consumption was at a favorable rate and consumers showing more confidence in the future positions. The statistics for July showed a decrease in smelters' hands of 4,535 tons in July. Production for July amounted to 47,627 tons and total shipments to 52,162 tons. Stocks in first hands on August 1 were 39,323 tons compared with 43,858 tons on July 1. The market developed a sagging tendency during the end of the month, and this caused some hesitation.

TIN

Price changes in the tin market were frequent lately, and the tendency was to lower values. Tin is the high priced commodity among non-ferrous metals, but that is largely a reflection of restricted production. It is also the speculative medium for professional traders who exercise a powerful control over all market movements both here and in London. Substantial quantities of Straits tin were sold at 65½c for prompt and August deliveries early in the past month, but subsequently these positions declined to 63¾c. During the closing days of August the course of the market was erratic, with Straits tin quoted at 63⅜c, being the lowest price this year.

The world's visible supply on August 1 amounted to 15,377 tons as compared with 15,638 tons on July 1 and 13,777 tons on August 1, 1926. Consumers bought freely during the last few weeks at receding prices, and in some cases covered part requirements up to the end of the year. The market closed dull at this writing, with Straits tin for spot and September quoted at 63⅜c @ 63⅞c and October delivery 63½ @ 63¾c.

LEAD

Buying was in good volume and the market strong early in August at the St. Louis basis of 6.42½c @ 6.50c and 6.60c New York as the price of the leading producer. Early in the month the New York price was advanced to 6.75c. A strong buying wave gave the market a good tone, and consumers covered nearby requirements freely. Weakness developed in the foreign market during the first half of August, and an easier tone prevailed here. The official price was reduced to 6.60c New York on August 24th, and there were reports of offers in the outside market at 5 to 10 points under that by sellers anxious for orders. Considerable business resulted at the low figures. Stocks in the United Kingdom are reported to be large and consumption must improve to prevent further

increase to the British supplies. Prices, however, have come down to a level where any show of broad interest would have a favorable effect on the market.

ALUMINUM

Consumption of aluminum is being well maintained for electrical equipment and utensils. Improved inquiring was noted at automobile factories, and increased demand is expected to develop against requirements for the fall and winter months. Imports of aluminum in June showed a heavy increase to 8,418,250 pounds, the largest since December, 1925, and compared with 4,386,611 pounds in May this year. Stocks in bond have also exceeded those for last year. It is thought, however, that imports and stocks will be absorbed by demand. Current market prices for virgin metal is maintained at 26c for Commercial 99% plus, and at 25c for Metallurgical 94-99% grade.

ANTIMONY

There was a fair amount of buying during the month, but recent transactions were at concessions in price. In general, the situation has developed weakness in tone compared with prices a month ago. Spot parcels sold down to 9⅜c in bond, being equal to 11⅜c duty paid. There has been a substantial tonnage of spot antimony carried in bond for some time, but the lethargy of the market has hindered disposal of these stocks at satisfactory prices. Chinese offerings have also appeared at concessions, but shipments show a stronger tendency lately and were quoted at 11¾c to 11⅞c duty paid for September delivery.

QUICKSILVER

There have been few new developments in quicksilver lately. The market is without special feature and quotes $120 to $121 per flask.

PLATINUM

Sales are on a restricted scale, and the market quotes $65 to $66 per ounce for refined platinum.

SILVER

The general situation in silver does not show any distinct improvement. Present price is quoted at 54¾c compared with 56⅜c on August 1. Chinese speculative operations were quite active a few weeks ago on the announcement that the Government of India sold 9,200,000 ounces of silver bullion. China sold heavily on this news, and the market declined in consequence. Later there was buying for both Chinese and Indian accounts.

India is still the world's major silver buyer, having taken in the last five years over 40% of the aggregate output of that metal. Indian imports of silver for the fiscal year ended March 31, 1927, amounted to 134,000,000 ounces, against 108,000,000 ounces for the previous fiscal year.

OLD METALS

A good volume of business developed when prices for virgin metals strengthened, although demand slackened when the primary markets showed an easier tendency. The export inquiries have been specially helpful in holding scrap prices steady. With any pronounced improvement in the new metals copper and brass grades are in position to follow an upward tendency. Foreign buying is expected to continue an important factor. Heavy lead and battery plates find ready outlet. Prices at New York are quoted at 10½c @ 10¾c for heavy copper, 6⅜c @ 7c for heavy brass, 9c @ 9¼c for light copper, 5⅜ @ 5½c for heavy lead, 3¾c @ 4c for old zinc, and 18½c @ 19c for aluminum clippings. The foregoing are prices dealers bid for the various grades of scrap.

Daily Metal Prices for the Month of August, 1927

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	3	4	5	8	9	10	11	12	15	16	17
Copper (f. o. b. Ref) c/lb. Duty Free													
Lake (Delivered)	13.375	13.375	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.50	13.375	13.375
Electrolytic	13.125	13.125	13.25	13.25	13.25	13.25	13.25	13.25	13.25	13.25	13.20	13.125	13.125
Casting	13.00	13.00	13.125	13.125	13.125	13.00	13.00	13.00	13.00	13.00	13.00	12.875	12.875
Zinc (f. o. b. St. L.) c/lb. Duty 1¼ c/lb.													
Prime Western	6.40	6.45	6.425	6.425	6.40	6.35	6.35	6.40	6.40	6.40	6.40	6.375	6.40
Brass Special	6.45	6.525	6.525	6.525	6.50	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	65.00	65.625	65.25	65.25	65.50	65.125	65.125	65.125	64.875	64.75	64.50	64.375	63.75
Pig 99%	63.625	64.75	64.50	64.375	64.75	64.125	64.25	64.25	64.00	63.875	63.625	63.625	63.00
Lead (f. o. b. St. L.) c/lb. Duty 2½ c/lb.	6.50	6.55	6.55	6.675	6.575	6.55	6.55	6.50	6.50	6.50	6.50	6.40	6.425
Aluminum c/lb. Duty 5c/lb.	26	26	26	26	26	26	26	26	26	26	26	26	26
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	39	39	39	39	39	39	39	39	39	39	39	39	39
Antimony (J & Ch) c/lb. Duty 2c/lb.	12.125	12.00	12.00	12.00	12.125	12.00	12.00	12.00	12.00	12.00	11.875	11.875	11.625
Silver c/oz. Troy Duty Free	56.375	56	55.50	55.375	55.375	55.375	54.375	54.25	54.125	54.50	54.50	54.50	54.625
Platinum $/oz. Troy Duty Free	66	66	66	66	66	66	66	66	66	66	66	66	66

	18	19	22	23	24	25	26	29	30	31	High	Low	Aver.
Copper (f. o. b. Ref) c/lb. Duty Free.													
Lake (Delivered)	13.35	13.35	13.25	13.25	13.25	13.25	13.25	13.25	13.25	13.25	13.50	13.25	13.378
Electrolytic	13.	13.00	13.00	12.90	12.90	13.00	13.00	13.00	13.00	13.00	13.25	12.90	13.109
Casting	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	13.125	12.75	12.897
Zinc (f. o. b. St. L.) c/lb. Duty 1¼ c/lb.													
Prime Western	6.40	6.40	6.35	6.325	6.30	6.30	6.25	6.30	6.30	6.275	6.45	6.25	6.364
Brass Special	6.45	6.45	6.45	6.40	6.40	6.35	6.30	6.35	6.35	6.35	6.525	6.30	6.434
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	64.125	64.25	63.75	63.75	64.25	63.875	63.625	63.75	63.50	63.625	65.625	63.50	64.467
Pig 99%	63.25	63.25	62.75	62.625	63.25	62.875	62.50	62.875	62.75	62.80	64.75	62.50	63.551
Lead (f. o. b. St. L.) c/lb. Duty 2½ c/lb.	6.40	6.40	6.40	6.325	6.25	6.25	6.25	6.25	6.25	6.25	6.675	6.25	6.430
Aluminum c/lb. Duty 5c/ lb.	26	26	26	26	26	26	26	26	26	26	26	26	26
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	39	39	39	39	39	39	39	39	39	39	39	39	39
Antimony (J & Ch) c/lb. Duty 2c/lb.	11.375	11.375	11.375	11.50	11.50	11.625	11.75	11.75	11.75	11.75	12.125	11.375	11.799
Silver c/oz. Troy Duty Free	54.625	54.50	54.125	54.375	54.375	54.50	54.625	54.75	54.875	54.50	56.375	54.125	54.788
Platinum $/oz. Troy Duty Free	66	66	66	66	66	66	66	66	66	66	66	66	66

Metal Prices, September 6, 1927

NEW METALS

Copper: Lake, 13.375. Electrolytic, 13.00. Casting, 12.75
Zinc: Prime Western, 6.30. Brass Special, 6.375.
Tin: Straits, 63.75. Pig, 99%, 62.875.
Lead: 6.15. Aluminum, 26.00. Antimony, 11.75.
Nickel: Ingot, 35. Shot, 36. Elec., 39. Pellets, 40.
Quicksilver: flask, 75 lbs. $121.00. Bismuth, $1.85 to $2.00.
Cadmium, 75. Cobalt, 97%, $2.60. Silver, oz., Troy, 54.875.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $66.00.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	9¾to10¾
Brass Ingots, Red	11½to13
Bronze Ingots	12½to16
Casting Aluminum Alloys	21 to24
Manganese Bronze Castings	23 to40
Manganese Bronze Ingots	12 to16
Manganese Bronze Forging	32 to40
Manganese Copper, 30%	25 to35
Monel Metal Shot	28
Monel Metal Blocks	32
Parsons Manganese Bronze Ingots	18¼to19¾
Phosphor Bronze	13½to15
Phosphor Copper, guaranteed 15%	18 to22
Phosphor Copper, guaranteed, 10%	17 to21
Phosphor Tin, guaranteed 5%	75 to80
Phosphor Tin, no guarantee	70 to80
Silicon Copper, 10%.....according to quantity.....	28 to32

OLD METALS

Buying Prices		Selling Prices
11¼to11¾	Heavy Cut Copper	12¾to13¼
10¾to11¼	Copper Wire	12¼to12½
9¼to 9¾	Light Copper	10¾to11
9 to 9½	Heavy Machine Composition	10 to10¼
7½to 7¾	Heavy Brass	8¾to 9
6¼to 6½	Light Brass	7½to 7¾
7¼to 7½	No. 1 Yellow Brass Turnings	8¾to 9¼
8¼to 8¾	No. 1 Composition Turnings	9¾to10¼
6¼to 6½	Heavy Lead	7¼to 7½
4¼to 4½	Zinc Scrap	5¼to 5¾
10 to11	Scrap Aluminum Turnings	13 to15
14½to15	Scrap Aluminum, cast alloyed	18 to19
20 to20½	Scrap Aluminum, sheet (new)	22½to23
38 to40	No. 1 Pewter	42 to44
12	Old Nickel Anodes	14
18	Old Nickel	20

Wrought Metals and Alloys

COPPER SHEET

Mill shipments (hot rolled)	21c. to 22c. net base
From stock	22c. to 23c. net base

BARE COPPER WIRE

15¼c. to 15½c. net base, in carload lots.

COPPER SEAMLESS TUBING

24c. to 25c. net base.

SOLDERING COPPERS

300 lbs. and over in one order	20½c. net base
100 lbs. to 200 lbs. in one order	21c. net base

ZINC SHEET

Duty sheet, 15% Cents per lb.

Carload lots, standard sizes and gauges, at mill, less 8 per cent discount	10.00 net base
Casks, jobbers' price	10.50 net base
Open Casks, jobbers' price	10.75 to 11.25 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price	38c.
Aluminum coils, 24 ga., base price	34c.
Foreign	40c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods	53c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finish Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10½c. over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 55¾c. to 57¾c. per ounce, Troy.

BRASS MATERIAL—MILL SHIPMENTS

In effect August 2, 1927
To customers who buy 5,000 lbs. or more in one order.

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	$0.18¼	$0.19¾	$0.21¾
Wire	.18¾	.20¼	.22¼
Rod	.16	.20½	.22½
Brazed tubing	.26¼	....	.31½
Open seam tubing	.26¼	....	.31½
Angles and channels	.29¼	....	.34½

For less than 5,000 lbs. add 1c. per lb. to above prices.

BRASS SEAMLESS TUBING

23⅛c. to 24⅛c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	20¼c. net base
Muntz or Yellow Metal Sheathing (14"x48")	18¼c. net base
Muntz or Yellow Rectangular sheet other Sheathing	19¼c. net base
Muntz or Yellow Metal Rod	16¼c. net base

Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	26 c.	10% Quality	29 c.
15% "	27½c.	15% "	32¾c.
18% "	28¾c.	18% "	36 c.

MONEL METAL SHEET AND ROD

Hot Rolled Rods (base) 35	Full Finished Sheets (base) 42
Cold Drawn Rods (base) 43	Cold Rolled Sheets (base) 50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over. Prices f. o. b. mill.

Supply Prices, September 6, 1927

ANODES

Copper:	Cast	20⅛c. per lb.
	Rolled	19⅛c. per lb.
	Electrolytic	20c. per lb.
Brass:	Cast	19⅛c. per lb.
	Rolled	19⅛c. per lb.
Zinc:	Cast	13c. per lb.
Nickel:	90-92%	45c. per lb.
	95-97%	47c. per lb.
	99%	49c. per lb.
Silver:	Rolled silver anodes .999 fine are quoted from 57½c. to 59½c. Troy ounce, depending upon quantity purchase.	

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb.	$2.75/lb.	$2.65/lb.
6-8 & over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

12" 20 ply 64/68 Unbleached	$32.35-33.10
14" 20 ply 64/68 Unbleached	41.15-41.65
12" 20 ply 80/92 Unbleached	33.05
14" 20 ply 80/92 Unbleached	44.80
12" 20 ply 84/92 Unbleached	38.35-42.85
14" 20 ply 84/92 Unbleached	52.00-57.40
12" 20 ply 80/84 Unbleached	38.35-39.40
14" 20 ply 80/84 Unbleached	52.00-53.05

Sewed Pieced Buffs, per lb., bleached 55-70c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.11-.16
Acid—Boric (Boracic) Crystals	lb.	.12
Chromic	lb.	.39
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.19-23½
Denatured, bbls.	gal.	.57
Alum—Lump, Barrels	lb.	.03¼
Powdered, Barrels	lb.	.042
Aluminum sulphate, commercial tech	lb.	.02⅜
Aluminum chloride solution in carboys	lb.	.06½
Ammonium—Sulphate, tech. bbls.	lb.	.03¾
Sulphocyanide	lb.	.65
Arsenic, white, kegs	lb.	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Borax Crystals (Sodium Biborate), bbls.	lb.	.04½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls.	lb.	.28
Chromic Sulphate	lb.	.37
Copper—Acetate (Verdegris)	lb.	.37
Carbonate, bbls.	lb.	.17
Cyanide (100 lb. kegs)	lb.	.50
Sulphate, bbls.	lb.	.05¾
Cream of Tartar Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Flour-spar (Calcic flouride)	ton	$75.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$14.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron, Sulphate (Copperas), bbl.	lb.	.01½
Lead Acetate (Sugar of Lead)	lb.	.13¾
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Nickel—Carbonate dry, bbls.	lb.	.29
Chloride, bbls.	lb.	.17-.18
Salts, single 300 lb. bbls.	lb.	.10½
Salts, double 425 lb. bbls.	lb.	.10
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity		.35-.40
Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.09¾
Potassium Bichromate, casks (crystals)	lb.	.08½
Carbonate, 96-98%	lb.	.07½
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.06
Silver Chloride, dry	oz.	.86
Cyanide (fluctuating)	oz.	.60
Nitrate, 100 ounce lots	oz.	.40½
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.20
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls.	lb.	.04¾
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.02
Sulpho Cyanide	lb.	.45
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.45½
Tripoli, Powdered	lb.	.03
Wax—Bees, white ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.11-.12
Chloride, casks	lb.	.06¾
Cyanide (100 lb. kegs)	lb.	.41
Sulphate, bbls.	lb.	.03½